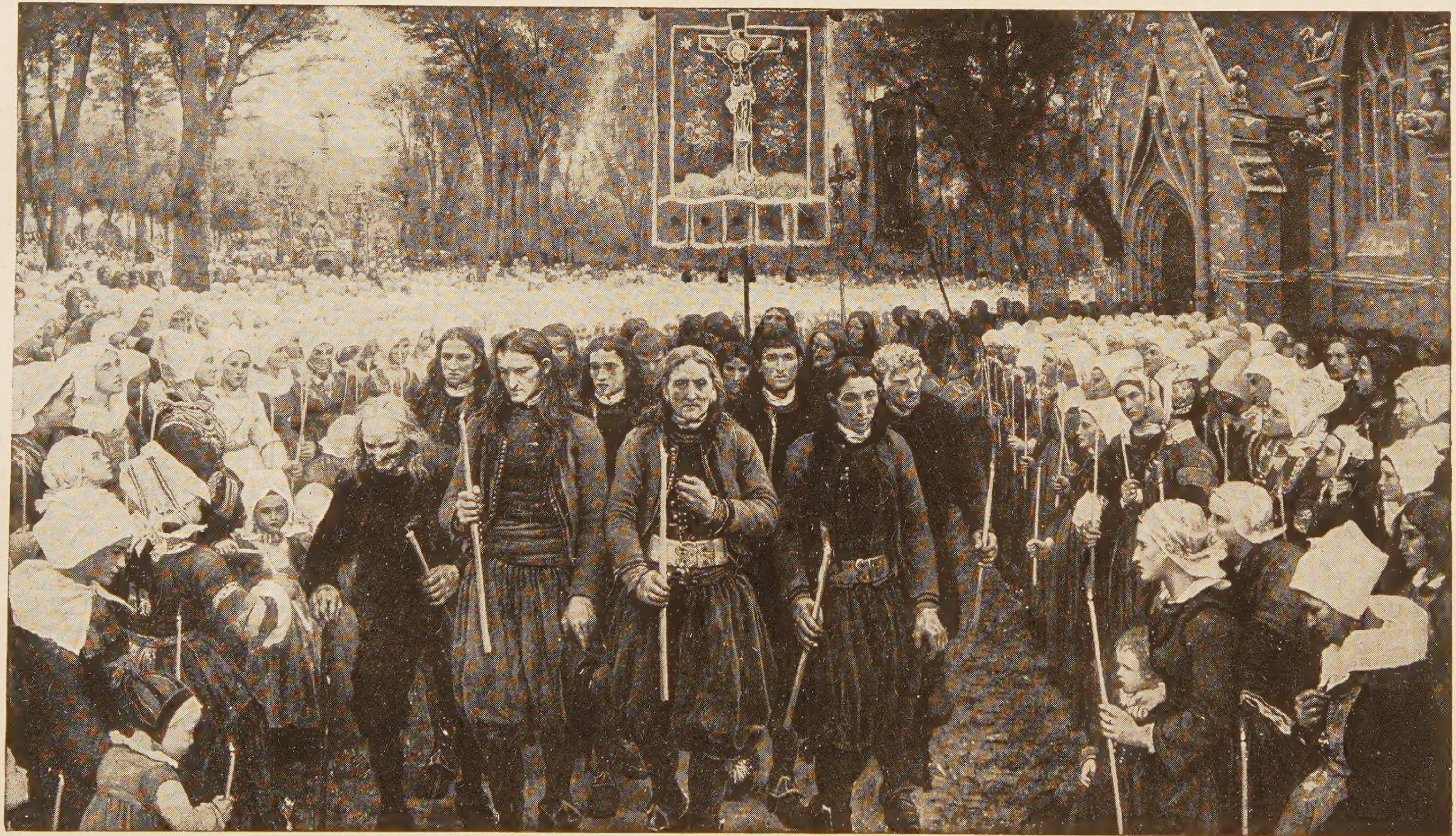
THE BOOK OF KNOWLEDGE

Digitized by the Internet Archive
in 2026

https://archive.org/details/bookofknowledge0010vari

A RELIGIOUS PROCESSION IN BRITTANY



This picture shows a religious procession in Brittany, painted by Jules Adolphe Breton. The Brittany peasants are descendants of the old Gauls, and many strange legends still retain their hold on their minds and their religion. On each saint's fete day a pilgrimage or *pardon* is celebrated. Here is a band of peasants at Kergoat beginning a pilgrimage. Note the quaint costumes of the men and the white caps of the women looking like a garden of flowers.

The Book of Knowledge

The Children's Encyclopædia

EDITORS-IN-CHIEF

ARTHUR MEE
Temple Chambers, London

HOLLAND THOMPSON, Ph. D.
The College of The City of New York

With an Introduction by

John H. Finley, LL. D.
President of The College of The City of New York

DEPARTMENTAL EDITORS AND CONTRIBUTORS

All Countries
FRANCES EPPS

Natural History
ERNEST INGERSOLL

Plant Life
EDWARD STEP

Stories and Legends
EDWARD WRIGHT

Familiar Things
HAROLD BEGBIE

Men and Women
ERNEST A. BRYANT

Our Own Life
DR. C. W. SALEEBY

Famous Books
J. A. HAMMERTON

School Lessons
A. M. SKINNER, B. S.

Poetry and Rhymes
A. VON HARTMANN

Dominion of Canada
W. PETERSON, LL. D., D. Litt.

The United States
HOLLAND THOMPSON, Ph.D.

The Earth
DR. C. W. SALEEBY

Golden Deeds
M. PERRY MILLS

Book of Wonder
ARTHUR MEE

Things to Make & Do
H. G. FLEMING

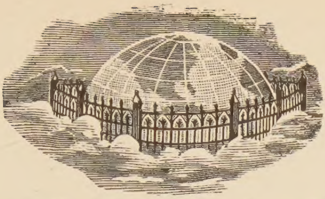
Volume X.

NEW YORK: THE GROLIER SOCIETY
LONDON: THE EDUCATIONAL BOOK CO.

Text and Illustrations in this work are protected
by copyright as follows:

Copyright, 1911, 1912, by THE GROLIER SOCIETY
Copyright, 1911, by THE EDUCATIONAL BOOK CO.
Copyright, 1910, 1911, 1912, by M. PERRY MILLS
Copyright, 1908, by AMALGAMATED PRESS, LTD.
Copyright, 1868, 1870, 1872, 1874, 1875, 1876, 1878, 1881, 1883, 1884, 1886, 1887, 1888, 1889, 1890, 1891, 1902, 1906, by TICKNOR & FIELDS, JAMES R. OSGOOD & CO., and HOUGHTON, MIFFLIN & CO.
Copyright, 1874, 1880, 1892, 1894, 1895, 1896, 1904, 1908, by CHARLES SCRIBNER'S SONS
Copyright, 1908, by THE CENTURY CO.
Copyright, 1906, by THE BAKER & TAYLOR CO.
Copyright, 1901, 1902, 1906, 1907, 1909, by H. C. WHITE CO.
Copyright, 1897, 1907, by THE AMERICAN BOOK CO.
Copyright, 1890, 1899, by JAMES WHITCOMB RILEY
Copyright by PHOTOGRAPHISCHE GESELLSCHAFT
Copyright by KEYSTONE VIEW CO.
Copyright by UNDERWOOD & UNDERWOOD
Copyright, 1899, by R. L. SINGLEY

The poems by Thomas Bailey Aldrich, Phoebe Cary, Ralph Waldo Emerson, Oliver Wendell Holmes, James Russell Lowell, John Greenleaf Whittier, Henry Wadsworth Longfellow, Edmund Clarence Stedman, Richard Watson Gilder, John Hay, Edward R. Sill, Bayard Taylor and Celia Thaxter included in this work are reprinted by permission of, and by special arrangement with, Houghton Mifflin Company, the authorized publishers of the Works of these authors. The poems by Robert Louis Stevenson, Eugene Field, Mary Mapes Dodge, Richard Henry Stoddard and Henry Van Dyke included in this work are printed by permission of Charles Scribner's Sons.



CONTENTS OF THIS VOLUME

This is a short guide only to the principal contents of this volume. It is not possible to give the titles of all the Poems and Rhymes, Legends, Problems, colour pages, questions in the Wonder Book, and many other things that come into the volume; but in all cases are given the pages where these parts of our book begin. The full list of these things comes into the big index to the whole work.

PAGE

THE BOOK OF THE EARTH

The Earth's Changing Face . . . 3003
Forests and Deserts 3071
The Crust of a Fiery Furnace . . 3227

THE BOOK OF THE UNITED STATES

Writers of Famous American Songs 2953
The New Woman 3063
What New York City Does for Its Children 3193
American Heroes of Science . . 3200

THE BOOK OF FAMILIAR THINGS

The Splendor of the Grass . . 2975
The Story in a Pair of Shoes . . 3097
A First Talk About Trees . . . 3177

THE BOOK OF WONDER

Is There a Man in the Moon? . . 3031
Why Is It Warm in Summer? . . 3032
Where Does Pumice Stone Come From? 3034
Where Does All the Dust Go? . . 3035
Why Is Snow Lighter than Rain? . 3036
Why Is Medicine Nasty? . . . 3089
What Is a Mirage? 3090
Why Is Ice Slippery? 3092
What Is a Thunderbolt? . . . 3093
Why Do Not Flowers Freeze under Snow? 3094
What Makes the Sound in an Organ? 3096
Can a Sound Be Felt? . . . 3233
Why Do Things Fade in the Sun? . 3235
Why Does Chloroform Send Us to Sleep? 3236
Is the Moon Hot Inside? . . . 3237
Why Does a Diamond Cut Glass? . 3238
What Makes Sun Spots? . . . 3241
Why Are Salt Water Fishes Not Salt? 3242

See index for full list of questions

THE BOOK OF NATURE

The Life of the Ant World . . 2941
Butterflies and Moths 2983
Some Insect Foes of Man . . . 3139

PAGE

THE BOOK OF MEN AND WOMEN

Some Founders of Religions . . 2995
Kings and Queens of Scotland . . 3079

THE BOOK OF OUR OWN LIFE

The Bread by Which We Live . . 2923
How and When to Eat 3045
The Real Value of Foods . . . 3109
The Value of Meat as Food . . . 3213

THE BOOK OF CANADA

Land Birds of Canada, I. . . . 3037
Wild Flowers of Canada, II. . . 3049

THE BOOK OF GOLDEN DEEDS

A Race for the Life Boat . . . 2951
The Bold Hero of the Mountains . 2952
The Friend of the Slaves . . . 3009
The Apprentice Boy and His Master's Children 3010
The Arab Patriot of Algeria . . 3167
The Girl Who Sold Her Hair . . 3168
The Prince Who Gave Up His Freedom 3168

THE BOOK OF STORIES

ALICE'S ADVENTURES IN WONDERLAND

Alice in Wonderland 2929
The Mad Tea Party 3055
Alice and the Queen of Hearts . . 3115
The Fables of Æsop, the Slave 2939, 3062, 3124
Jack and the Bean-Stalk . . . 3159
How Truth Got to the Bottom of a Well 3162
The Tiger, the Brahmin and the Jackal 3164
The Emperor's Nightingale . . . 3203
The Blue Bird 3206
The Sad Heart of Little Trott . . 3209
The Wooden Daughter of Descartes . 3210
Sir Tristram of Lyonnesse . . . 3211

SOME ENGLISH LEGENDS

The Luck of Edenhall 3166
The Pits of Woolpit 3166
The Fairy Fountain of Killarney . 3166
The Giants and the Isle of Man . . 3166
St. Vincent's Rocks 3208

PAGE
Byard's Famous Leap 3208
The Fairy Tulips 3208
The Store That Never Grew Less . 3208

THE BOOK OF POETRY

The Curfew Bell 3025
Oh, Look at the Moon 3026
Mine Host of the "Golden Apple" . 3026
Rock of Ages 3026
A Prayer 3026
A Canadian Boat Song 3026
German Folk-Songs in English . . 3027
The Prisoner of Chillon . . . 3125
The Old Clock on the Stairs . . 3126
The Spring Walk 3126
The Faithful Bird 3127
The Council of Horses 3127
The Wind and the Moon . . . 3128
The Best School of All . . . 3128
Little Verses 3029

THE BOOK OF ALL COUNTRIES

Switzerland of the Snows . . . 2959
Italy, the Land of Romance . . . 3011
The Balkan Peninsula 3149
Turkey and the Balkans . . . 3219

THINGS TO MAKE AND TO DO

How to be Your Own Magician

The Wizard's Wand and the Magic Purse 3068
The Self-Suspending Wand . . . 3174

A Little Garden Month by Month

The Little Vegetable Garden at the End of March 2971
The Little Vegetable Garden at the End of April 3176

Miscellaneous

PAGE
How to Study the Weather . . . 2969
A Clever Word Game 2970
A Good Game to Play on a Train . 2971
Hare and Hounds on Horseback . . 2972
The Way to Use a Microscope . . 2974
What to Do in Case of Fire . . 3067
How to Make a Wheelbarrow . . 3069
What to Make from an Elder Branch 3070
Golf for Boys and Girls . . . 3169
A Serviette-Holder Made from Curtain Rings 3172
Making a Garden Seat 3173

Puzzles

What Is Wrong in this Room? . . 3175

THE BOOK OF SCHOOL LESSONS

Reading

The Different Kinds of Pronouns . 3129

Writing

Capital M, N, S, L and D . . . 3130

Arithmetic

Multiplying Big Numbers Together . 3131

Music

The Beautiful Land of Sound . . 3133

Drawing

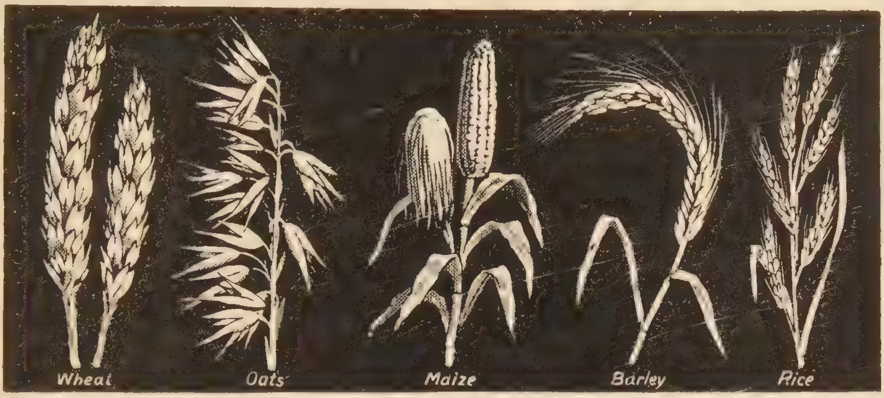
Measuring Things from a Distance . 3134

French

Picture Lesson 3136

COLORED PLATES

Well Known Butterflies and Moths . 2982
The Old Woman Tossed in a Basket 3030
Some Insects in their Natural Colors . 3140



THE BREAD BY WHICH WE LIVE

CONTINUED FROM 2795

THERE is no other food which requires so much to be said about it as milk does, but there are several others about which we must learn. There can be no doubt that the next best food is bread, "the staff of life," as it is called. So if we have milk and bread or bread and milk, we have everything that the body requires, while neither contains any poisonous or injurious things.

There is special reason at the present time to understand the facts of bread, because the history of the part of mankind to which we belong—the history of the white races—has now reached a great crisis. What is called Western civilisation, to which we belong, is really built up on bread, as contrasted with the Eastern civilisations, which are built mainly upon rice. Wheat is vastly superior to rice as an article of diet, but the white population of the world is now rapidly outrunning its wheat supply. England long ago outgrew the wheat supply of that country, and lives on wheat from abroad, the larger part of which is American wheat. But it is possibly true that before many of the children who read this book have grown up there will be no more wheat sent from the United States, for that country will need every grain of the wheat she grows for her own use.

Bread has already begun to get dearer, and will, no doubt, go on getting dearer. There is no food known, whether produced by Nature or put together by men of science in the laboratory, that can replace wheat as the food of Western peoples. And therefore this wheat problem—first discussed about ten years ago by Sir William Crookes, who has since been justified in everything he said—is one of the greatest problems of the age, and it is our business here to study the facts of wheat in order that when we grow up to be men and women, and have this tremendous question to face, we may be properly prepared for the task.

When it was said in the Bible that "all flesh is grass," the words could be applied in more senses than one. The existence of the human race, as a whole, to-day depends upon grass. We read on page 2696 that for every human being there is required on the average a certain area of green leaves working for a certain number of hours a day. Now, it is the green leaves of grass that do this work for us. If we stand in the sun, we only get warm or hot and uncomfortable; we can make no starch or sugar by its power, but the grass can, and the particular grasses upon which mankind lives are called cereals. We eat not the leaves, but the fruits or seeds of these grasses, the food matter in which has been made by the leaves.

The first practical point to notice about this cereal food is its cheapness. There is really nothing else to compare with it for this. So little of our labour is needed, after all, to produce it; the plant itself is so capable a worker. Roughly speaking, a vegetable food has only about one-fourth the cost of animal food, and bread made of wheat is the cheapest of all foods. This reckoning is made not by outside weight, but by the weight of what, in the bread, is actually food and used as food. Comparisons by mere weight are absurd, for you may be weighing water or woody fibre or bone. The nearest food to rival the bread, for cheapness, is oatmeal. The contrast between bread and meat is really astonishing. Two cents' worth of bread contains eight ounces of dry food material, but if you spent that amount on meat you would get little more than an ounce. Further, good wheat flour is cheaper than all other foods, if we reckon its proteid only, and we know how tremendously important proteid is. Bread is much dearer than flour, but even bread, so far as its proteid is concerned, is still cheaper than milk, meat, or eggs.

BREAD, ONE OF THE BEST AND CHEAPEST FOODS THAT WE CAN BUY

The difference in price between flour and bread is so great as to make it a pity, except from the baker's point of view, that people no longer bake at home nearly so much as they used to do. A recent writer has said that bread is one of the cheapest foods not only with regard to the actual weight, but also with regard to the variety of the nourishment contained; and the purchaser who expends his modest five or ten cents on a well-cooked loaf may rest assured that he could not spend his money to better advantage, except, perhaps, in the purchase of oatmeal, which is slightly cheaper. But wheat flour is cheaper than oatmeal, so that by buying flour we are spending our money to better advantage still.

Just as we find that a given kind of milk is perfectly composed for the needs of the young creature for which it was made, so we find that the wheat plant does its work perfectly for its own needs. This is to say that the wheat grain consists partly of the germ of the young plant and of material supplied for it to live upon. This material is, indeed, almost an exception to the rule that milk is the only ready-made food designed by Nature. The source of energy for the future plant constitutes the greater part of the wheat grain, and it mainly consists of starch. Thus, flour or bread contains an excess of starch in proportion to its proteid, and a deficiency of fat.

THE BEST KIND OF LOAF THAT WE CAN EAT

These facts lend further point to the deep saying "man cannot live by bread alone." As flour or bread is rather lacking in proteid and fat, we see good sound reason for our practice of eating bread with cheese or butter.

The science of bread-making is really one of national importance. It is possible to treat the wheat grain in such a fashion that practically nothing gets into the flour but the starch. This produces an extremely white loaf, much admired by those who know no better. The whitest loaf is the starchiest and the least rich in proteid. In general, we should prefer a cream-coloured loaf to a pure white one. It is the germ of the grain that is the really living part. It is in it, therefore, that we find the proteid which every living thing contains. By recent methods of bread-making, what is called "germ-bread" is produced, which means that the germ that used to be lost is saved for the flour. By eating such bread together with water, man could probably live for a long time. In any case, about four-tenths of a loaf is water, though, even so, bread is much less watery than raw meat.

THE DIFFERENCE BETWEEN BROWN BREAD AND WHITE BREAD

The covering of the wheat grain is called bran. The bran and the germ contain colouring matter, and if they are used we get a brown bread. Many people suppose that brown bread is superior, and this has been argued on scientific grounds. But, in the first place, brown bread is very much wetter, so that we are paying a good deal for water; and, in the second place, the bran, which is really woody, interferes with the digestion of the food materials in the flour. The result is that the proteid of brown bread is not absorbed as it should be, and the bran even interferes with the absorption of other things, such as milk. This is quite contrary to what is generally believed, but that makes it all the more necessary and important for us to know it.

WHY WE SHOULD EAT CRUSTS, AND WHY STALE BREAD IS BETTER THAN NEW

The crust of bread is more valuable than the crumb, simply because the crumb is so largely water. It is very wasteful indeed not to eat our crusts. Quite apart from the richness of the crust in food material, there is the fact that biting it is good for the teeth. This is especially true of children's teeth, and one of the real and deep reasons why our teeth are so bad nowadays is that they were not properly exercised when they were young. As we have seen twenty times already, there is no living power or structure that will not be injured if its work is done for it. I do not know which of these two reasons for eating crusts is the more important, but when I consider how much our teeth count for in the health and happiness of our whole lives, I am inclined to think that the great value of crusts lies in the work which they give the teeth.

If we cook bread and turn it into toast or rusks, or if we make crackers, we produce a very nourishing kind of food which is also much more digestible than ordinary bread because it is much drier. When we eat the crumb of new bread, we find it difficult to digest because it can scarcely be chewed and because it is so wet. If it is very wet, it cannot suck up the juices of the mouth. Now, we have already learnt that the digestion of starch and the turning of it into sugar largely depends upon the saliva, and bread is a very starchy food. We should therefore take it stale, or in the form of toast, biscuits, or crusts. These are so dry that they soak up the saliva of our mouths if we are careful to chew them well.

SOME OF THE GREAT QUESTIONS THAT WE HAVE TO CONSIDER ABOUT WHEAT

If we follow these simple rules, our teeth, our stomachs, our purses, and our whole lives will profit. We should always buy bread made of "seconds" flour, not "patents." The seconds flour is richer in proteid, but happens to be darker, and the craze for whiteness, which means starchiness, in bread leads us to think it inferior.

As we all know, wheat can be grown in Europe, but the amount that is grown is not sufficient to feed the people. Now, there is no wealth but life and what makes and serves life. If, then, any part of that continent which might be growing wheat is growing grain from which to make alcohol, or is used for the preservation of game, which is trivial as a source of national food supply, then the people are failing to make wealth where they might. Also, it is their duty not only to grow wheat where they can, but to grow it as intensely as they can. Modern study of plant life is teaching how to increase enormously the output of the cereals, partly by proper treatment of the soil, and partly by passing electricity through electric wires suspended on poles a few feet above the soil. Lastly, it is possible to grow kinds of wheat which will resist disease, such as the wheat disease called "rust"; that will produce a flour that has all the good qualities for bread-making; and it is to be hoped that a wheat may also be grown that will produce a larger number of grains on each stalk than it is possible to get now.

HOW THE OLD WORLD LIVED ON RICE AND THE NEW WORLD LIVES ON WHEAT

These are a few of the great questions at which many wise men are working who know the facts about the probably approaching end of the American wheat supply and about the absolute necessity of wheat for national existence.

In recent times a good many special preparations have been made from wheat. Two of them, which are largely advertised under fancy names, have malt added to them, which aids the digestion, and they can scarcely be overpraised. True wheat flour is also disguised under such names as semolina, vermicelli, and macaroni.

We have seen that wheat is the best of all the grasses upon which mankind feeds, but there are others of very great importance. There is, for instance, rice, upon which the ancient civilisations of the earth are founded. Rice is not very digestible; it contains a great deal of starch and much less proteid than wheat. It is improbable that

Western civilisation, with its great activity, could be maintained upon rice rather than wheat. It may well be that on rice there is possible only the more slowly moving life of the East. Of course, these things are not certain, nor have we the right to say that our activity and restlessness are always wise, but it is probable that the great food differences play the chief part in this matter. It is best to cook rice by steaming, and of course we should try to remedy its defect in proteid by adding eggs or cheese. This practical necessity has been discovered by the cook long ago, as we see when we look at the rice dishes of the South.

BARLEY AND MAIZE AND CORNFLOUR, AND THEIR VALUE AS FOODS

Barley is another grass which produces food. It is much inferior to wheat, but it is said that loaves made half and half of wheat and barley meal are pleasant and good. We grow much barley in this country, not as a source of food at all, but as a source of alcohol, and we grow it where we might grow wheat.

Maize, or Indian corn, is much used in this country, and can scarcely be overpraised. It is very cheap, very nourishing, and very well absorbed. A great service was done to Ireland when maize was introduced into that country during the potato famine about sixty years ago. Our chief authority says that, " in view of these facts, and of the approaching scarcity of wheat, one cannot help a feeling of regret that maize is not more widely adopted as food amongst the working classes of all countries." Cornstarch is a food stupidly made from maize in such a way as to get practically nothing but the starch. It is, therefore, on the same level as arrowroot, which is really just starch, and is an inferior order of food altogether.

WHY OATMEAL PORRIDGE IS VERY GOOD FOR BOYS AND GIRLS

Oats are the last cereal that we need mention, but they demand special notice. We find that, when a grass grows in a cold country, it prepares for its offspring a high proportion of heat-producing material ; whereas, if a grass grows in the tropics, it will be poor in such material. Thus oats, which grow in the North, contain a lot of fat ; while rice is specially poor in fat, and therefore the less suitable for a northern civilisation. The fat in oats is valuable, of course, and we have already seen that this cereal is very rich in proteid. The strength and size of the Scotsman at his best, his vigour of brain and body, and his capacity to withstand his climate, probably depend in no small degree upon the excellence of oatmeal as a food and its richness in the very substances most needed in such a climate.

Much less attention than is needed has yet been paid to the preparation of oatmeal. Only people whose digestion is very strong can deal with large quantities of the ordinary oatmeal, which contains a great deal of husk besides its fat. Some of the new " rolled oats " are much more easy to digest, but, on the other hand, they are prepared in a way which rather reduces, though not by very much, the amount of nourishment in them. The manufacturers have yet to learn how to get rid of all the husk without losing anything else. Oatmeal porridge is very well absorbed by those who can take it. The child who has porridge and milk for breakfast, and who can enjoy it, is fortunate.

HOW THE PEOPLE'S FOOD IS CHANGING IN SCOTLAND, AND THE PITY OF IT

Nothing can surpass this combination for children, and therefore the world owes more to it than we recognise. So important is this question that we ought to spare no trouble in making the porridge so that it can be taken even by children. We must devote as much labour to it as we devote to the preparation of our cup of coffee after dinner. We must find the right kind of oatmeal ; we must cook it in the right way, and we must add to it what it needs to make it nice. Some people like to add sugar to porridge and milk, and we know that sugar is an excellent food ; or you may add salt or jam or syrup. But somehow or other we should arrange our oatmeal so that we can take it regularly every day.

Two great changes have been going on for some years past in the large cities of Scotland, and especially in Edinburgh, Glasgow, and Dundee. In the first place, very careful inquiry has shown that the diet of the people is changing. This especially applies to the poorer classes, and is most serious, as it affects the children. They used to get porridge and milk—or, at any rate, porridge—before they went to school. More and more, nowadays, they are getting bread and jam—a "jam-piece," as they call it. The bread is not the best bread, but very starchy, and the jam is little more than sugar and chemical preservatives. Compared with porridge and milk, such a diet is rubbish.

THE DESTRUCTION OF THE HIGH QUALITY OF LIFE IN THE SCOTTISH CITIES

It is clear, then, that all science of food is nonsense, and it does not matter at all what we eat, or else this rapid, general, and extreme change in the food habits of the people must have very large consequences indeed.

Now, these same cities show us at the same time a change going on which can only be called terrible. It is doubtful whether anything so marked and quick has ever been observed anywhere else. This is a very rapid and intense damaging of the people. Properly grown on oatmeal, and under good conditions, the Scotsman is, on the average, the tallest and heaviest man in the world; the younger generations in the big Scottish cities, largely fed on starchy bread and jam, are promising to become, very soon, about the smallest race on the face of the earth. They are already dwarfed by inches. Few things more terrible anywhere are going on than this destruction of the quality of life in Edinburgh, Glasgow, and Dundee, in a land which has for so long led the world in many matters, and, best of all, in the right feeding, education, and upbringing of children, with consequences which are written upon the face of the earth from Pole to Pole and from China to Peru.

THE SORT OF BREAKFAST A CHILD OUGHT NOT TO GO TO SCHOOL UPON

In our study of food, and especially of the cereals, we must beware of forgetting the importance of other things. We must not suppose that the destruction of the city populations in Scotland —where nineteen children out of every twenty require a dentist and do not get him, and suffer for life in consequence—is entirely due to the change in their food. It is also due in Dundee, for instance, to matters of feeding in the first year, because the mothers are going out to look after machinery in factories, and the future life of Scotland is left to chance at home. But the contrast between oatmeal and milk and bread and jam is one we must especially remember. Bread and jam is all very well in its way, but it is not a complete breakfast for a child to trudge to school and do his lessons upon, even if a little stale tea is taken into the bargain.

There are so many other foods to consider, like eggs and meat and fruit, and so many other things, like tea and coffee, which are not really foods, that we have not space to say much more about grass. But we must think of this great thing rightly. When we cut a piece of bread and put it into our mouth, we want to see what we are doing from the point of view of the life of the earth.

HOW THE WHOLE STRENGTH OF OUR FOOD COMES FROM THE SUN

We know that the whole animal world depends upon the green vegetable world, which depends upon the sun. Bread does not happen to be green. It was made *in* the green leaves of grass, but is not actually made *of* them, but of the grain they make. Thus, when we take a piece of bread, we are apt to forget that we are really eating grass, which, in its turn, is transformed sunlight, air, and soil. We are putting these things, the energy of sunlight, the carbon from the air, and the other things from the soil, into our mouths; and the whole animal world, from the little amœba of the ponds up to human poets and kings and mothers and children, lives to-day and has always lived upon grass. This is true even if we prefer a diet of nothing but raw meat and hot water, for the meat was made from grass, or even if the meat be a tiger chop, the meat upon which the tiger was fed was itself transformed grass.

In the last resort the whole animal world is therefore vegetarian, and the act of chewing a crust, or swallowing a crumb of bread, is typical, every time it is performed, of the relations that exist between animals and vegetables and the sun that gives them life.

Later on, in the Story of the Earth, we shall learn to look upon the surface of the earth as the place where green leaves make the lives of animals and men possible. The study of our neighbour, the planet Mars, will teach us how precious the green life is; and we shall understand the wisdom of planting trees again in North America.

The next part of this is on page 3045.

ALICE FALLING DOWN THE RABBIT-HOLE

A white rabbit with pink eyes hurried past Alice, remarking, as he drew his watch from his waistcoat pocket, "Oh dear! Oh dear! I shall be too late!" This aroused the curiosity of the little girl. It was an odd thing to see a rabbit with a waistcoat and a watch! So she ran after him, and, without thinking, pursued him into the rabbit-hole. But he kept ahead, and presently she found herself falling down a great well or pit, which seemed to go right down to the middle of the earth, and had queer cupboards and furniture all the way down. What happened when she and the rabbit got to the bottom we shall learn in good time.

LEWIS CARROLL'S FAMOUS STORY

As we have already read all about Lewis Carroll on page 1472, we need say nothing about the author of "Alice's Adventures in Wonderland." We are going to read the story itself. It is not possible to print here every word of it, to tell all the adventures at full length; but we have taken the story as a whole, and where parts of the original have had to be left out, these have been re-told very briefly, so that the reader can follow the adventures of Alice from beginning to end. Excepting such passages, the story is told in the words of its author. It has been specially illustrated for us by the famous artist Mr. Harry Furniss, who was a friend of Lewis Carroll, and drew the pictures for two of his other fairy tales. As Mr. Furniss knew the author's ideas of how his stories should be illustrated, these charming pictures, drawn according to these ideas, rank high among the many illustrations of "Alice's Adventures."

ALICE IN WONDERLAND

CONTINUED FROM 2849

Alice was beginning to get very tired of sitting by her sister on the bank, and of having nothing to do; once or twice she had peeped into the book her sister was reading, but it had no pictures or conversations in it, "and what is the use of a book," thought Alice, "without pictures or conversations?"

So she was considering in her own mind (as well as she could, for the hot day made her feel very sleepy and stupid) whether the pleasure of making a daisy-chain would be worth the trouble of getting up and picking the daisies, when suddenly a white rabbit with pink eyes ran close by her.

There was nothing so *very* remarkable in that; nor did Alice think it so very much out of the way to hear the Rabbit say to himself: "Oh dear! Oh dear! I shall be too late!" (when she thought it over afterwards, it occurred to her that she ought to have wondered at this, but at the time it all seemed quite natural); but when the Rabbit actually *took a watch out of his waistcoat pocket*, and looked at it, and then hurried on, Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waistcoat pocket or a watch to take out of it, and, burning with curiosity, she ran across the field after him, and was just in time to see him pop down a large rabbit-hole under the hedge.

"Oh dear! Oh dear! I shall be too late!" said the White Rabbit, hurrying past.

In another moment down went Alice after him, never once considering how in the world she was to get out again.

The rabbit-hole went straight on like a tunnel for some way, and then dipped suddenly down, so suddenly that Alice had not a moment to think about stopping herself before she found herself falling down what seemed to be a very deep well.

Either the well was very deep, or she fell very slowly, for she had plenty of time as she went down to look about her, and to wonder what was going to happen next. First, she tried to look down and make out what she was coming to, but it was too dark to see anything; then she looked at the sides of the well, and noticed that they were filled with cupboards and bookshelves.

Here and there she saw maps and pictures hung upon pegs. She took down a jar from one of the shelves as she passed; it was labelled ORANGE MARMALADE, but, to her great disappointment, it was empty. She did not like to drop the jar for fear of killing somebody underneath, so managed to put it into one of the cupboards as she fell past it.

"Well," thought Alice to herself, "after such a fall as this, I shall think nothing of tumbling downstairs. How brave they'll all think me at home! Why, I wouldn't say anything about it, even if I fell off the top of the house." (Which was very likely true.)

Down, down, down. Would the fall *never* come to an end? "I wonder how many miles I've fallen by this time?" she said aloud. "I must be getting somewhere near the centre of the earth. Let me see: that would be four thousand miles down, I think——" (for, you see, Alice had learnt several things of this sort in her lessons in the schoolroom, and though this was not a *very* good opportunity for showing off her knowledge, and there was no one to listen to her, still it was good practice to say it over). "Yes, that's about the right distance—but then I wonder what latitude and longitude I've got to?" (Alice had not the slightest idea what latitude was, or longitude either, but she thought they were nice grand words to say.)

Presently she began again speaking to herself. "I wonder if I shall fall right *through* the earth? How funny it'll seem to come out among the people that walk with their heads downwards! The Antipathies, I think" (she was rather glad there was no one listening this time, as it didn't sound at all the right word); "but I shall have to ask them what the name of the country is, you know. Please, ma'am, is this New Zealand or Australia?" And she tried to curtsey as she spoke. Fancy *curtseying* as you're falling through the air! Do you think you could manage it? "And what an ignorant little girl she'll think me for asking! No, it will never do to ask; perhaps I shall see it written up somewhere."

Down, down, down. There was nothing else to do, so Alice began talking again. "Dinah'll miss me very much to-night, I should think." (Dinah was the cat.) "I hope they'll remember her saucer of milk at tea-time. Dinah, my dear, I wish you were down here with me. There are no mice in the air, I'm afraid, but you might catch a bat, and that's very like a mouse, you know. But do cats eat bats, I wonder?" And here Alice began to get rather sleepy, and went on saying to herself, in a dreamy sort of way: "Do cats eat bats? Do cats eat bats?" and sometimes, "Do bats eat cats?" for, you know, as she couldn't answer either question, it didn't much matter which way she put it. She felt that she was dozing off, and had just begun to dream that she was walking hand in hand with Dinah, and was saying to her very earnestly: "Now, Dinah, tell me the truth, did you ever eat a bat?" when suddenly, thump! thump! down she came upon a heap of sticks and dry leaves, and the fall was over.

"What a curious feeling!" said Alice. "I must be shutting up like a telescope."

Alice was not a bit hurt, and she jumped up on to her feet in a moment. She looked up, but it was all dark overhead; before her was another long passage, and the White Rabbit was still in sight, hurrying down to it. There was not a moment to be lost. Away went Alice like the wind, and was just in time to hear him say, as he turned a corner: "Oh, my ears and whiskers, how late it's getting!" She was close behind him when she turned the corner, but the Rabbit was no longer to be seen. She found herself in a long, low hall, which was lit up by a row of lamps hanging from the roof.

There were doors all round the hall, but they were all locked, and when Alice had been all the way down one side and up the other, trying every door, she walked sadly down the middle, wondering how she was ever to get out again.

Suddenly she came upon a little three-legged table, all made of solid glass. There was nothing on it but a tiny golden key, and Alice's first idea was that this might belong to one of the doors of the hall; but, alas! either the locks were too large, or the key was too small, for, at any rate, it would not open any of them. However, on the second time round she came upon a low curtain she had not noticed before, and behind it was a little door about fifteen inches high. She tried the little golden key in the lock, and, to her great delight, it fitted.

Alice opened the door, and found that it led into a small passage, not much larger than a rat-hole. She knelt down and looked along the passage into the loveliest garden you ever saw. How she longed to get out of that dark hall, and wander about among those beds of bright flowers and those cool fountains, but she could not even get her head through the doorway; "and even if my head would go through," thought poor Alice, "it would be of very little use without my shoulders. Oh, how I wish I could shut up like a telescope! I think I could, if I only knew how to begin." For, you see, so many out-of-the-way things had happened lately that Alice had begun to think that very few things indeed were really impossible.

"Curiouser and curiouser!" cried Alice. "Now I'm opening out like the largest telescope that ever was. Good-bye, feet! Oh, my poor little feet!"

There seemed to be no use in waiting by the little door, so she went back to the table, half hoping she might find another key on it, or, at any rate, a book of rules for shutting people up like telescopes. This time she found a little bottle on it ("which certainly was not here before," said Alice), and tied round the neck of the bottle was a paper-label, with the words DRINK ME beautifully printed on it in large letters.

It was all very well to say "Drink me," but the wise little Alice was not going to do *that* in a hurry. "No, I'll look first," she said, "and see whether it's marked '*poison*' or not"; for she had read several nice little stories about children who had got burnt, and eaten up by wild beasts and other unpleasant things, all because they *would* not remember the simple rules their friends had taught them; such as, that a red-hot poker will burn you if you hold it too long; and that, if you cut your finger *very* deeply with a knife, it usually bleeds; and she had never forgotten that, if you drink much from a bottle marked "poison," it is almost certain to disagree with you sooner or later.

However, this bottle was *not* marked "poison," so Alice ventured to taste it, and, finding it very nice (it had, in fact, a sort of mixed flavour of cherry-tart, custard, pineapple, roast turkey, toffy, and hot buttered toast), she very soon finished it off.

"What a curious feeling!" said Alice. "I must be shutting up like a telescope."

And so it was, indeed; she was now only ten inches high, and her face brightened up at the thought that she was now the right size for going through the little door into that lovely garden. . . . But, alas for poor Alice, when she got to the door she found she had forgotten the little golden key, and when she went back to the table for it she found she could not possibly reach it.

She could see it quite plainly through the glass, and she tried her best to climb up one of the legs of the table, but it was too slippery; and when she had tired herself out with trying, the poor little thing sat down and cried. . . .

Soon her eye fell on a little glass box that was lying under the table. She opened it, and found in it a very small cake, on which the words EAT ME were beautifully marked in currants.

"Well, I'll eat it," said Alice, "and if it makes me grow larger, I can reach the key; and if it makes me grow smaller, I can creep under the door; so either way I'll get into the garden, and I don't care which happens."

She ate a little bit, and said anxiously to herself: "Which way? Which way?" holding her hand on the top of her head to feel which way it was growing, and she was quite surprised to find that she remained the same size; to be sure, this is what generally happens when one eats cake, but Alice had got so much into the way of expecting nothing but out-of-the-way things to happen that it seemed quite dull and stupid for life to go on in the common way.

So she set to work, and very soon finished off the cake.

"Curiouser and curiouser!" cried Alice (she was so much surprised that for the moment she quite forgot how to speak good English). "Now I'm opening out like the largest telescope that ever was. Good-bye, feet!" (for when she looked down at her feet they seemed to be almost out of sight, they were getting so far off). "Oh, my poor little feet! I wonder who will put on your shoes and stockings for you now, dears? I'm sure *I* shan't be able. I shall be a great deal too far off to trouble myself about you; you must manage the best way you can. But I must be kind to them," thought Alice, "or perhaps they won't walk the way I want to go. Let me see; I'll give them a new pair of boots every Christmas." . . .

Just at this moment her head struck against the roof of the hall; in fact, she was now more than nine feet high, and she at once took up the little golden key and hurried off to the garden door.

Poor Alice! It was as much as she could do, lying down on one side, to look through into the garden with one eye; but to get through was more hopeless than ever. She sat down and began to cry again.

"You ought to be ashamed of yourself," said Alice, "a great girl like you" (she might well say this), "to go on crying in this way! Stop this moment, I tell you!"

But she went on all the same, shedding gallons of tears, until there was a large pool all round her, about four inches deep and reaching half down the hall.

After a time she heard a little pattering of feet in the distance, and she hastily dried her eyes to see what was coming. It was the White Rabbit returning, splendidly dressed, with a pair of white kid gloves in one hand and a large fan in the other. He came trotting along in a great hurry, muttering to himself as he came: "Oh, the Duchess! the Duchess! Oh, won't she be savage if I've kept her waiting!"

Alice felt so desperate that she was ready to ask help of anyone; so, when the Rabbit came near her, she began, in a low, timid voice:

"If you please, sir——"

The Rabbit started violently, dropped the white kid gloves and the fan, and skurried away into the darkness as hard as he could go.

Alice took up the fan and gloves, and, as the hall was very hot, she kept fanning herself all the time she went on talking:

"Dear, dear! How queer everything is to-day! And yesterday things went on just as usual. I wonder if I've been changed in the night? Let me think: was I the same when I got up this morning? I almost think I can remember feeling a little different. But if I'm not the same, the next question is: Who in the world am I? Ah, *that's* the great puzzle!"

And she began thinking over all the children she knew, that were of the same age as herself, to see if she could have been changed for any of them.

"I'm sure I'm not Ada," she said, "for her hair goes in such long ringlets, and mine doesn't go in ringlets at all; and I'm sure I can't be Mabel, for I know all sorts of things, and she, oh, she knows such a very little! Besides, *she's* she, and *I'm* I, and—oh dear, how puzzling it all is! I'll try if I know all the things I used to know. Let me see: four times five is twelve, and four times six is thirteen, and four times seven is—oh dear, I shall never get to twenty at that rate! However, the multiplication table don't signify; let's try geography. London is the capital of Paris, and Paris is the capital of Rome, and Rome—no, *that's* all wrong, I'm certain. I must have been changed for Mabel. I'll try and say 'How doth the little——.'" And she crossed her hands on her lap as if she were saying lessons, and began to repeat it, but her voice sounded hoarse and strange, and the words did not come the same as they used to do:

> "How doth the little crocodile
> Improve his shining tail,
> And pour the waters of the Nile
> On every golden scale!
>
> "How cheerfully he seems to grin,
> How neatly spreads his claws,
> And welcomes little fishes in
> With gently smiling jaws!"

Alice was quite certain these were not the right words, and she rather fancied now that she must be Mabel, after all. But presently, on looking down at her hands, she was surprised to see that she had put on one of the Rabbit's little white kid gloves while she was talking.

"How *can* I have done that?" she thought. "I must be growing small again."

She got up, and went to the table to measure herself by it, and found that, as nearly as she could guess, she was now about two feet high, and was going on shrinking rapidly. She soon found out that the cause of this was the fan she was holding, and she dropped it hastily, just in time to save herself from shrinking away altogether.

"That *was* a narrow escape," said Alice, a good deal frightened at the sudden change, but very glad to find herself still in existence; "and now for the garden." And she ran with all speed back to the little door; but, alas! the little door was shut again, and the little golden key was lying on the glass table as before, "and things are worse than ever," thought the poor child, "for I never was so small as this before, never! And I declare it's too bad, that it is!"

As she said these words her foot slipped, and in another moment, splash! she was up to her chin in salt water. Her first idea was that she had somehow fallen into the sea, "and in that case I can go back by railway," she said to herself. . . . However, she soon made out that she was in the pool of tears which she had wept when she was nine feet high.

"I wish I hadn't cried so much," said Alice, as she swam about, trying to find her way out. "I shall be punished for it now, I suppose, by being drowned in my own tears. That *will* be a queer thing, to be sure. However, everything is queer to-day."

Just then she heard something splashing about in the pool a little way off, and she swam nearer to make out what it was. At first she thought it must be a walrus or hippopotamus, but then she remembered how small she was now, and she soon made out that it was only a mouse that had slipped in like herself.

"Would it be of any use, now," thought Alice, "to speak to this mouse? Everything is so out-of-the-way down here that I should think very likely it can talk; at any rate, there's no harm in trying." So she began: "O Mouse,

It was the White Rabbit, splendidly dressed. He came trotting along, muttering to himself: "Oh, the Duchess! the Duchess! Oh, won't she be savage if I've kept her waiting!"

do you know the way out of this pool? I am very tired of swimming about here, O Mouse." (Alice thought this must be the right way of speaking to a mouse; she had never done such a thing before, but she remembered having seen in her brother's Latin Grammar, "A mouse—of a mouse—to a mouse—a mouse—O mouse.") The Mouse looked at her rather inquisitively, and seemed to her to wink with one of its little eyes, but it said nothing.

"Perhaps it doesn't understand English," thought Alice; "I dare say it's a French mouse, come over with William the Conqueror." So she began again: "Où est ma chatte?" which was the first sentence in her French lesson book. The Mouse gave a sudden leap out of the water, and seemed to quiver all over with fright. "Oh, I beg your pardon!" cried Alice hastily, afraid that she had hurt the poor animal's feelings. "I quite forgot you don't like cats."

"Not like cats!" cried the Mouse, in a shrill, passionate voice. "Would *you* like cats if you were me?"

"Well, perhaps not," said Alice, in a soothing tone; "don't be angry about it. And yet I wish I could show you our cat Dinah; I think you'd take a fancy to cats if you could only see her. She is such a dear quiet thing," Alice went on, half to herself, as she swam lazily about in the pool, "and she sits purring so nicely by the fire, licking her paws and washing her face; and she is such a nice soft thing to nurse, and she's such a capital one for catching mice——. Oh, I beg your pardon!" cried Alice again, for this time the Mouse was bristling all over, and she felt certain it must be really offended. "We won't talk about her any more if you'd rather not."

"We, indeed!" cried the Mouse, who was trembling down to the end of its tail. "As if *I* would talk on such a subject! Our family always hated cats—nasty, low, vulgar things! Don't let me hear the name again!"

"I won't, indeed!" said Alice, in a great hurry to change the subject of conversation.

"Are you—are you fond—of—of dogs?" The Mouse did not answer, so Alice went on eagerly: "There is such a nice little dog near our house I should like to show you. A little bright-eyed terrier, you know, with oh, such long curly brown hair! And it'll fetch things when you throw them, and it'll sit up and beg for its dinner, and all sorts of things—I can't remember half of them—and it belongs to a farmer, you know, and he says it's so useful, it's worth a hundred pounds! He says it kills all the rats and——. Oh dear!" cried Alice, in a sorrowful tone. "I'm afraid I've offended it again." For the Mouse was swimming away from her as hard as it could go, and making quite a commotion in the pool as it went.

So she called softly after it:

"Mouse, dear! Do come back again, and we won't talk about cats or dogs either, if you don't like them!" When the Mouse heard this, it turned round and swam slowly back to her; its face was quite pale (with passion, Alice thought), and it said in a low, trembling voice: "Let us get to the shore, and then I'll tell you my history, and you'll understand why it is I hate cats and dogs."

It was high time to go, for the pool was getting quite crowded with the birds and animals that had fallen into it; there were a duck and a dodo, a lory and an eaglet, and several other curious creatures. Alice led the way, and the whole party swam to the shore.

A very queer-looking party of dripping birds and animals now gathered on the bank of the Pool of Tears; but they were not so queer as their talk. First the Mouse, who was quite a person of authority among them, tried to dry them by telling them frightfully dry stories from history. But Alice said she was as wet as ever after she had listened to the bits of English history; so the Dodo proposed a Caucus race. They all started off when they liked, and stopped when they liked. The Dodo said everybody had won, and Alice had to give the prizes. Luckily she had some sweets, which were not wet, and there was just one for each of them, but none for herself. The party were anxious she, too, should have a prize, and as she happened to have a thimble, the Dodo commanded her to hand it to him, and then, with great ceremony, the Dodo presented it to her, saying: "We beg your acceptance of this elegant thimble," and they all cheered. Of course, Alice thought this all very absurd; but they were dry now, and began eating their sweets. Then the Mouse began to tell Alice its history, and to explain why it hated C and D—for it was afraid to say cats and dogs. But she soon offended the mouse, first by mistaking its "long and sad tale" for a "long tail," and next by thinking it meant "knot" when it said "not," so that it went off in a huff. Then when she mentioned Dinah to the others, and told them that was the name of her cat, the birds got uneasy, and one by one the whole party gradually went off and left her all alone. Just when she was beginning to cry, she heard a pattering of little feet, and half thought it might be the Mouse coming back to finish its story.

It was the White Rabbit, trotting slowly back again, and looking anxiously about as he went, as if he had lost something; and she heard him muttering to himself: "The Duchess! The Duchess! Oh, my dear paws! Oh, my fur and whiskers! She'll get me executed, as sure as ferrets are ferrets! Where *can* I have dropped them, I wonder?" Alice guessed in a moment that he was looking for the fan and the pair of white kid gloves, and she very good-naturedly began hunting about for them, but they were nowhere to be seen—everything seemed to have changed since her swim in the pool, and the great hall, with the glass table and the little door, had vanished completely.

Very soon the Rabbit noticed Alice, as she went hunting about, and called out to her in an angry tone: "Why, Mary Ann, what *are* you doing out here? Run home this moment, and fetch me a pair of gloves and a fan. Quick, now!" And Alice was so much frightened that she ran off at once in the direction he pointed to, without trying to explain the mistake that he had made.

"He took me for his housemaid," she said to herself as she ran. "How surprised he'll be when he finds out who I am! But I'd better take him his fan and gloves—that is, if I can find them." As she said this, she came upon a neat little house, on the door of which was a bright brass plate with the name W. RABBIT engraved upon it. She went in without knocking, and hurried upstairs, in great fear lest she should meet the real Mary Ann, and be turned out of the house before she had been able to find the fan and gloves.

"Would it be of any use, now," thought Alice, "to speak to this mouse? Everything is so out-of-the-way down here that I should think very likely it can talk; at any rate, there's no harm in trying." So she began: "O Mouse, do you know the way out of this pool? I am very tired of swimming about here, O Mouse."

"How queer it seems," Alice said to herself, "to be going messages for a rabbit! I suppose Dinah'll be sending me on messages next." . . .

By this time she had found her way into a tidy little room with a table in the window, and on it—as she had hoped—a fan and two or three pairs of tiny white kid gloves. She took up the fan and a pair of the gloves, and was just going to leave the room, when her eye fell upon a little bottle that stood near the looking-glass. There was no label this time with the words DRINK ME, but, nevertheless, she uncorked it and put it to her lips.

"I know *something* interesting is sure to happen," she said to herself, "whenever I eat or drink anything; so I'll just see what this bottle does. I do hope it'll make me grow large again, for really I'm quite tired of being such a tiny little thing."

It did so, indeed, and much sooner than she had expected; before she had drunk half the bottle, she found her head pressing against the ceiling, and had to stoop to save her neck from being broken. . . . She went on growing and growing, and very soon had to kneel down on the floor; in another minute there was not even room for this, and she tried the effect of lying down with one elbow against the door, and the other arm curled round her head.

Still she went on growing, and, as a last resource, she put one arm out of the window, and one foot up the chimney, and said to herself:

"Now I can do no more, whatever happens. What *will* become of me?"

Luckily for Alice, the little magic bottle had now had its full effect, and she grew no larger; still, it was very uncomfortable, and, as there seemed to be no sort of chance of her ever getting out of the room again, no wonder she felt unhappy.

"It was much pleasanter at home," thought poor Alice, "when one wasn't always growing larger and smaller, and being ordered about by mice and rabbits. I almost wish I hadn't gone down that rabbit-hole; and yet—and yet—it's rather curious, you know, this sort of life. I do wonder what *can* have happened to me! When I used to read fairy tales, I fancied that kind of thing never happened, and now here I am in the middle of one." . . .

After a few minutes she heard a voice outside, and stopped to listen.

"Mary Ann! Mary Ann!" said the voice. "Fetch me my gloves this moment!" Then came a little pattering of feet on the stairs. Alice knew it was the Rabbit coming to look for her, and she trembled till she shook the house, quite forgetting that she was now about a thousand times as large as the Rabbit, and had no reason to be afraid of him.

Presently the Rabbit came up to the door, and tried to open it; but, as the door opened inwards, and Alice's elbow was pressed hard against it, that attempt proved a failure. Alice heard him say to himself: "Then I'll go round and get in at the window."

"*That* you won't," thought Alice, and, after waiting till she fancied she heard the Rabbit just under the window, she suddenly spread out her hand, and made a snatch in the air. She did not get hold of anything, but she heard a little shriek and a fall, and a crash of broken glass, from which she concluded that it was just possible he had fallen into a cucumber-frame, or something of the sort.

Next came an angry voice, the Rabbit's:

"Pat! Pat! Where are you?" And then a voice she had never heard before: "Sure then, I'm here. Digging for apples, yer honour."

"Digging for apples, indeed!" said the Rabbit angrily. "Here! Come and help me out of *this*!" (Sounds of more broken glass.)

"Now tell me, Pat, what's that in the window?"

"Sure, it's an arm, yer honour." (He pronounced it "arrum.")

"An arm, you goose! Who ever saw one that size? Why, it fills the whole window!"

"Sure, it does, yer honour; but it's an arm for all that."

"Well, it's got no business there, at any rate; go and take it away."

There was a long silence after this, and Alice could only hear whispers now and then, such as: "Sure, I don't like it, yer honour, at all—at all." "Do as I tell you, you coward!"

And at last she spread out her hand again, and made another snatch in the air.

This time there were *two* little shrieks, and more sounds of broken glass.

"What a number of cucumber-frames there must be!" thought Alice. "I wonder what they'll do next? As for pulling me out of the window, I only wish they *could*. I'm sure I don't want to stay in here any longer."

She waited for some time without hearing anything more. At last came a rumbling of little cart-wheels, and the sound of a good many voices all talking together; she made out the words: "Where's the other ladder? Why, I hadn't to bring but one; Bill's got the other. Bill, fetch it here, lad. Here, put 'em up at this corner. No, tie 'em together first, they don't reach half high enough yet. Oh,

ALICE AT THE STORY-TELLING PARTY

It was a queer-looking party of dripping birds and animals that gathered around Alice on the edge of the Pool of Tears. The Mouse tried to dry them by telling very, very dry stories from history, and Alice broke the party up at last by thoughtlessly speaking of her cat Dinah. The animals simply couldn't bear to hear of Dinah or any other cat. So one by one the whole party gradually went off and left her all alone.

they'll do well enough; don't be particular! Here, Bill, catch hold of this rope! Will the roof bear? Mind that loose slate! Oh, it's coming down! Heads, below!" (a loud crash). "Now, who did that? It was Bill, I fancy. Who's to go down the chimney? Nay, *I* shan't. *You* do it? *That* I won't, then! Bill's got to go down. Here, Bill, the master says you've got to go down the chimney!"

"Oh! So Bill's got to come down the chimney, has he?" said Alice to herself. "Why, they seem to put everything upon Bill. I wouldn't be in Bill's place for a good deal; this fireplace is narrow, to be sure; but I *think* I can kick a little."

She drew her foot as far down the chimney as she could, and waited till she heard a little animal (she couldn't guess of what sort it was) scratching and scrambling about in the chimney close above her; then, saying to herself, "This is Bill," she gave one sharp kick, and waited to see what would happen next.

The first thing she heard was a general chorus of "There goes Bill!" then the Rabbit's voice alone: "Catch him, you by the hedge!" Then silence, and then another confusion of voices: "Hold up his head. Brandy now. Don't choke him. How was it, old fellow? What happened to you? Tell us all about it."

Last came a little feeble squeaking voice. ("That's Bill," thought Alice.) "Well, I hardly know. No more, thank'ye; I'm better now, but I'm a deal too flustered to tell you. All I know is, something comes at me like a Jack-in-the-box, and up I goes like a sky-rocket."

"So you did, old fellow," said the voices of the others, speaking in chorus.

"We must burn the house down," said the Rabbit's voice.

And Alice called out as loud as she could: "If you do, I'll set Dinah at you."

There was dead silence instantly, and Alice thought to herself: "I wonder what they *will* do next? If they had any sense, they'd take the roof off." After a minute or two, they began moving about again, and Alice heard the Rabbit say: "A barrowful will do to begin with."

"A barrowful of *what?*" thought Alice. But she had not long to doubt, for the next moment a shower of little pebbles came rattling in at the window, and some of them hit her in the face. "I'll put a stop to this," she said to herself, and shouted out: "You'd better not do that again!" which produced another dead silence.

Alice noticed, with some surprise, that the pebbles were all turning into little cakes as they lay on the floor, and a bright idea came into her head.

"If I eat one of these cakes," she thought, "it's sure to make some change in my size; and, as it can't possibly make me larger, it must make me smaller, I suppose."

So she swallowed one of the cakes, and was delighted to find that she began shrinking directly. As soon as she was small enough to get through the door, she ran out of the house, and found quite a crowd of little animals and birds waiting outside. The poor little Lizard, Bill, was in the middle, being held up by two guinea-pigs, who were giving it something out of a bottle. They all made a rush at Alice the moment she appeared; but she ran off as hard as she could, and soon found herself safe in a thick wood. What happened there and what the Blue Caterpillar said to her are told on page 3055.

ALICE IN THE RABBIT'S HOUSE

THE FABLES OF ÆSOP THE SLAVE

MERCURY AND THE WOODMAN

In the olden days, when people believed in a great many different gods, a man was cutting down a tree beside a river, when by accident the axe slipped out of his hand, fell into the water, and at once sank to the bottom. As the man was very poor, and could not afford to buy another axe, he sat down and grieved bitterly over his loss.

Suddenly the god Mercury appeared to him and asked him what was the matter. When the poor man told him, he at once dived to the bottom of the river, and when he came up again, held out a golden axe and asked the man if that was the one he had lost. The honest woodman said it was not. Then Mercury dived a second time, and brought up a silver axe. This, too, the woodman refused, saying that it did not belong to him.

The third time Mercury dived he brought up the iron axe that the woodman had lost. Its owner was delighted to see it, and thanked Mercury very warmly for restoring it to him. The god was so pleased with the man's honesty in refusing the gold and silver axes that he gave both of them to him as a reward.

When the woodman told the story to his companions, one of them went off to the river's bank, and purposely dropped his axe into the water. Then he sat down on the bank and pretended to cry and lament over his loss.

The god Mercury came as before, and, diving into the river, brought up a golden axe, and asked if that was the one the man had lost. He greedily snatched at it, and said that it was, upon which, Mercury threw it back into the river, and would not even restore the axe that the man had dropped.

Honesty is the best policy.

THE WOLF AND THE KID

A mother goat, who was going out in search of food, shut up her young kid at home and warned him not to open the door to anyone till she came back.

The wolf was hiding behind a bush close by, and heard what she said. As soon as she had gone he came and knocked at the door, and then, imitating the voice of the goat, called to the kid to open the door. But the kid was looking through the keyhole, and could see that it was not his mother; so he called out to the wolf to go away, saying that, however he might imitate the goat's voice, he looked far too much like a wolf to be trusted.

Never trust people who pretend to be different from what they really are.

THE FARMER AND THE STORK

A farmer set a net in his fields one day to catch the cranes and geese which came to eat the newly-sown corn. Several of these birds were caught in the net, and amongst them was a stork, who pleaded very hard for his life, telling the farmer that he was not a goose or a crane, but a poor, harmless stork; that he did not come to steal the corn, but merely came in company with the other birds.

"All this may be very true," replied the farmer, "but as I have caught you with the thieves, you must suffer the same punishment."

If we keep company with bad people, we must expect to suffer the consequences.

THE STAG LOOKING INTO THE WATER

A stag, drinking by the side of a pond, saw himself reflected in the water, as in a looking-glass. He stood admiring himself, and said: "Oh, what a beautiful pair of horns I have! How gracefully they hang over my forehead, and how nice they make my face look! I wish the rest of my body was as handsome; but I have such long, thin legs that I am really quite ashamed of anyone seeing them."

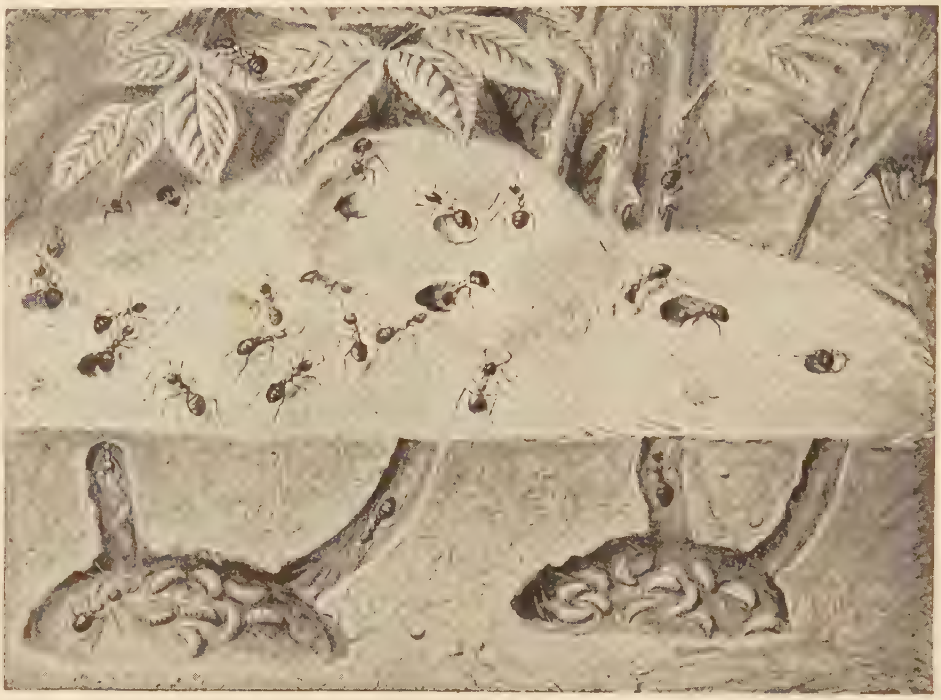
Just then came the noise of some huntsmen and a pack of hounds. Away darted the stag in a fright, and, bounding nimbly along on his slender legs, he soon left the men and dogs at a great distance behind him. Then he rushed into a wood to hide himself, but at the entrance his horns got entangled in some branches, and he was held fast till the hounds came and killed him.

As he was dying, he said: "Oh, how unfortunate I am! I see now that the horns of which I was so proud are the cause of my death, while the long, thin legs that I thought so ugly are the only things that could have saved me."

Often the things we like most are not the best for us; while some things we dislike are useful and valuable.

THE NEXT STORIES ARE ON PAGE 3055

A WONDERFUL CITY OF ANTS



When we look at an ants' nest in the garden we see only the top, and can but wonder what it is like below. This picture shows us the galleries leading down into the city. At the bottom are the baby ants, attended by workers.

Here the ants are all at home, down in the ground, so we are able to photograph the top of their city, without any of the busy workers getting in the way and blocking up the passages. Each of the holes that we see here is the end of an avenue leading into the wonderful fairy city below, and has, of course, been made entirely by the ants.

The photographs on these pages are by the Rev. S. N. Sedgwick, S. Kent, and others.

THE LIFE OF THE ANT WORLD

CONTINUED FROM 2826

WOOD ANT

THERE is a friendly quarrel between admirers of the bees and ants. Men who have devoted years to studying the life of the bee declare that their favourite is without doubt the most wonderful of creatures; while, on the other hand, the men who have for years and years pondered upon the marvels of ant life assert that *their* little friend is the greatest miracle in Nature. Those of us who read this have probably studied the story of the bee that begins on page 2815, and now we have an opportunity of comparing it with the story of the ant, and of deciding for ourselves which shall be our favourite.

As we compare the bees and their relatives, the ants, we may, in starting, give a thought to the differences and the resemblances between the two. They both have a marvellous organisation. They live together in great numbers upon a plan which seems almost human in its evidence of care and attention to details. The life of the bee appeals to most of us more than that of the ant, perhaps, because it is so beautiful and romantic. The labours of its day are passed among the flowers in the golden sunshine, and, largely through the visits of the bees which they supply with food, the flowers are made beautiful and fruitful.

We should, no doubt, have many flowers in the world if there were no ants, though we must remember that the ants, while not directly helping the flowers, do help indirectly, by killing insects which would injure the plants. For sheer beauty we may agree that the life-story of the bee is more charming than that of the ant. But when that is said, we have to admit that the life-story of the ant is the most extraordinary in the whole book of Nature. The ant is only a little insect, but when they consider his marvellous intelligence and the wonders of his daily life, great men place him next to man himself as the wisest of all created things. After all that we have read of the marvels of the animal world, we need very striking performances to make good such a claim as this, and now we must see how the ant justifies the generous things said of him.

There are over a thousand species of ants in the warm and temperate countries of the world—we in this country possess more than thirty kinds—therefore it will be impossible for us to go into the details of many separate species. We shall have to confine our attention to a few of the best known. Any one of them is remarkable enough to deserve long study. In what respect, we may well ask, are they superior in intelligence to the horse, the elephant, and the dog? They are superior because they live together in cities as human beings live; because they construct wonderful dwellings; because they divide their labours among themselves as we do; because they cultivate crops, and store food in barns; because they keep cows and milk them; because they keep pets.

HOW THE ANTS LOVE THEIR RELATIONS AND HATE ALL STRANGERS

Intelligence does not always result in good, and the intelligence of the ants leads them into mischief. They have armies which engage in fierce wars, wars fought solely for the purpose of robbery; and they make slaves of ants that are weaker than themselves. Are not these feats wonderful enough to justify the placing of the ants next in order of intelligence to mankind?

The ants are like ourselves in the way that they show their feelings. The stupid among ourselves hate foreigners. So do ants; they kill a stranger ant. We love our relations, or at least we should. The ants love their relations. They have the most wonderful memory. An ant which has been taken from its nest and kept captive for months, upon returning to its nest, is immediately recognised by the others, who caress it and show the greatest joy at its return. But if a strange ant should go into the nest with the returned wanderer, the rest at once kill the stranger.

There is something more than mere memory, as we know it, in this recognition of ants by ants. Their sense of smell must help them. We know that the sense of smell helps one ant to find another for which it is looking. We know, too, that the sense of smell will enable an ant to find its way back to a place where it has once been.

THE BABY ANT THAT IS BORN ABROAD AND WELCOMED TO ITS HOME

The sense of smell, we may say, then, must help in the recognition of an ant which has been absent from its family. That makes us think that each community of ants has a scent peculiar to itself, and for this reason: If the egg of an ant be taken from the nest and placed in another nest, there to be reared by other ants, the young ant, when at last placed in the nest from which it was first taken, is recognised and rejoiced over by the others, though they have never seen it before. There may be other colonies of ants of exactly the same sort in the neighbourhood, but the ants never make a mistake. They know the ant born from the egg laid in their nest, and welcome it with joy. If a young ant of their own species, reared from an egg laid in another nest, be put in, they at once kill it.

If they are like us in their building, in their wars, in their hatred of foreigners and their love of their own, they are like us again in their play and in their rejoicing. They wrestle and leap and play in their way as we do in ours, and when they are at their games possibly they laugh as heartily as we do, though our ears are not sensitive enough to hear the merriment which our eyes can plainly see.

THE QUEEN ANT WHO BITES OFF HER WINGS AND STAYS AT HOME

Like the bees, to whose family they belong, the ants have their queens, their drones—though we do not call the male ants drones—and their busy workers. They pass through the same stages as the bee. First there is the egg, next the larva, then the chrysalis, and finally the imago, or perfect insect.

The beginning of a colony of ants is like the beginning of a bee-hive. From their eggs are hatched the queens and males which have to go forth into the world. Therefore they have wings. The workers have no wings, and go through life on foot.

On a bright day in summer the young queens and the handsome males come out of the nest and sail away into the sunlight. It is their wedding day. For just this one day the queen has her wings. She might perhaps keep them if she chose, and fly again on other days. But Nature tells her that from this one day her place is in her own home. She never flies again. When she descends to the earth, she sets to work with jaws and feet and deliberately breaks off her wings. For the rest of her life she must walk, like the rest of the ants. When she ceases to fly, her duties in life begin. She has to found a new colony, or to lay eggs for a colony already existing.

With the poor male the case is different. His wedding day is the beginning and ending of his life in the air. His wedding and his death occur on the same day. He may be caught by a bird, or upon the ground some hideous spider may eat him. But, whatever his fate, he never tries to re-enter his old home. If worker ants of his own family see him lying on the ground, they do not help him. They know that he would be useless in the home, so they pass him by; and when the night comes, if he has lived so long, he dies. It seems sad, but it is a law of Nature, and it is no harder for the male ant to die at the close of his wedding day than for a worker ant to die when her course in life is run.

In spite of all we know about the habits of the ant, there is still some doubt as to the way in which an ant colony was formed. Lord Avebury, who is one of the greatest authorities in the world on ants, tried several times to get ants which had no queen to adopt a queen from another nest; but they attacked her, and would not have her.

HOW THE QUEEN ANT FORMS A COLONY AND RECEIVES HOMAGE

This suggests that if a queen is to set up her court with a numerous retinue of servants, she must begin at the end of her wedding day; that she must not attempt to settle down in one nest, and then go off to another. Apparently, what happens is this: When she descends to the earth after her first and last flight, she sees a number of worker ants, and goes off with them as her attendants to start a nest at once, or else they seize her and carry her off to their own nest. There may be two or three queen ants already in it if it is a large colony. They will not attack her as they would attack another queen which had been living since her wedding day in another nest. They can all be quite good friends together, each queen having her separate group of humble, loving attendants. When worker ants carry a young queen to their nest, they may clip off her wings themselves to prevent her going off and leaving them, and then set a guard over her until she settles down in happiness and comfort to dwell with them.

Let us suppose that *our* queen ant has by this time a home of her own, with her retinue about her. They show the greatest joy at her approach. Wherever she appears in the colony, a very keen observer has written, she is received with obedience and respect. Gladness is shown by all around her, expressed by singular acts of joy and pleasure. The worker ants have at such times a peculiar way of skipping and leaping, and of standing upon their hind legs and prancing with the others. They frisk and frolic among themselves out of love for their queen. Some of them run over her, others dance around her, and wherever she goes she is encircled by attendants.

THE GREAT RED ANT THAT FIRES A VOLLEY OF POISON TO DEFEND ITSELF

We call their dwelling a nest. It is more than a nest to them. It is a city and fortress and storehouse, all built with the greatest skill. Our common yellow ant makes an elaborate underground city, with galleries and halls, floor above floor. Every place has its proper purpose; everything is built on a careful plan. Our big red wood-ant is not content with earth as his materials. He gathers great heaps of pine-needles over his nest, and constructs a dome with shutters and doors, which are open during the day, but closed, like the doors of a fortress, at night. This ant inflicts a most painful wound if we pick it up, for it has powerful jaws, and can squirt from its body a poison called formic acid. We have all heard of formic acid, which men are now able to make from various substances. It is called formic after the Latin name for the ant, *formica*, and so called because the acid was first obtained from the ant.

There are as many forms of nests as there are forms of ants. In South America certain ants build those great ant-hills which the tamanoir and other ant-eaters break open. These are wonderful structures with their halls and galleries, their granaries, nurseries, and so forth.

A MONSTER ANT CITY BIGGER THAN A CITY SQUARE

What we call an ants' nest may include a whole series of ant dwellings of the same species. An explorer discovered one "nest," as we say, which consisted of over 200 colonies, and extended 200 yards in all directions from its centre. As there may be from 5,000 to 500,000 ants in each nest, we may reckon up for ourselves the probable number of ants in such a settlement.

Before leaving the subject, we must remember something about other famous forms of nests. That of the brown ant may consist of thirty or forty storeys, one above another. It takes five of the storeys to measure an inch in height, and in the same space there would be twenty-four of the dividing walls.

ANTS THAT MAKE BRICKS OF CLAY AND BUILD THEIR CITIES LIKE MEN

The brown ants make this great building by taking moist earth or clay, and moulding it with their mouths into little sticky pellets; then building each pellet into place, like our bricklayers setting bricks. They are really brickmakers and builders, with no tools, save their jaws and feelers and legs.

They share their labour with one another. While some of the ants make the pellets ready, others scoop little hollows in the floor, and the ridges that stand up between the hollows form the foundation upon which the walls are built. When the foundations are ready, the pellets are brought and laid on top, and pressed down by the jaws and feet of the bricklaying ants. When the walls and pillars have reached the proper height, pellets are stuck into each angle and on top of the pillars. Then other pellets are stuck to the edges of those already in position. As soon as one lot is dry another lot is added. The pellets are so moist and sticky that they readily become attached to those against which they are pressed, and so in a very short time these little master-builders have built a ceiling two inches across over a chamber or gallery.

Other ants convert the dust of wood, earth, and spiders' webs into a paste, which hardens; and they make their buildings of this. Others make tiles of another substance, while the umbrella ant, or Saüba ant, cuts leaves, and with these thatches its roof, making domes two feet high and forty yards across.

ANT SOLDIERS THAT WEAR HELMETS AND FACE THE FOE BRAVELY

Smoke was blown into an opening in one of these Saüba colonies, and it came out from a number of other holes at least seventy yards apart. These ants are divided into five classes. There are the males and the queens, there are the ordinary workers, and then there are two special sorts of soldier ants—one lot with hard, horny helmets, and the others having big heads, covered with stiff hair. These soldiers do no ordinary work. What, then, can be their purpose?

They attend the workers who go out to gather the leaves, and, should they be attacked by other ants, the hard-headed soldiers form a ring round them, with their heads towards the foe, and no matter how hard the enemy try, they cannot make any impression upon the thick, armoured heads of the soldier Saübas.

But it is the worker Saübas which are the more interesting. They climb the trees, and with their sharp jaws cut the leaves into pieces of about the size of a dime. If the tree is a high one, the workers may let the pieces which they cut drop to the ground to form a heap for the cutters to carry away when they descend. If the colony be a numerous one, other workers will be under the tree in readiness to receive the pieces as they fall, and to carry them off to the dwelling. As they go, they carry the pieces of leaf upright by their edges, and look as if they bore umbrellas or parasols to keep off the rays of the blazing sun in which they are working. That is how they get their common name.

HOW THE ANTS STRIP FRUIT-TREES TO OBTAIN A ROOF FOR THEIR HOME

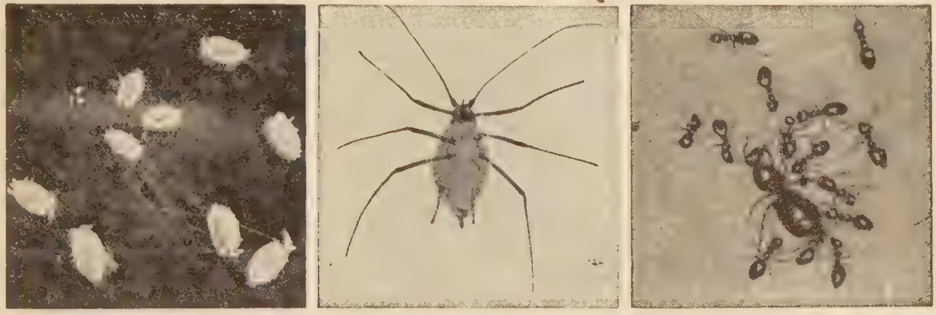
When these carriers arrive at the dwelling, other workers take the leaves from them, and carry them in for the builders to fit into their places in the dome. Soft pellets of earth are mixed with them, and they go to form a perfectly watertight roof to one of the most wonderful structures of the ant-world. It is very admirable, of course, as the work of insects, but it is terribly costly to men. The leaves that these ants prefer are generally those of fruit-trees, or of coffee, and so many do they take that they strip and kill the trees.

These feats of the ants would be remarkable if the latter could be supposed to use any tools; but, as we know, they have nothing but their jaws and feet. It is time, therefore, that we paid a moment's attention to the structure of the ant. The body is in three parts: the head, the thorax, or chest, and the abdomen—the part of the body which contains the stomach, and in which the food is digested. The head contains the eyes, and bears two pairs of jaws,

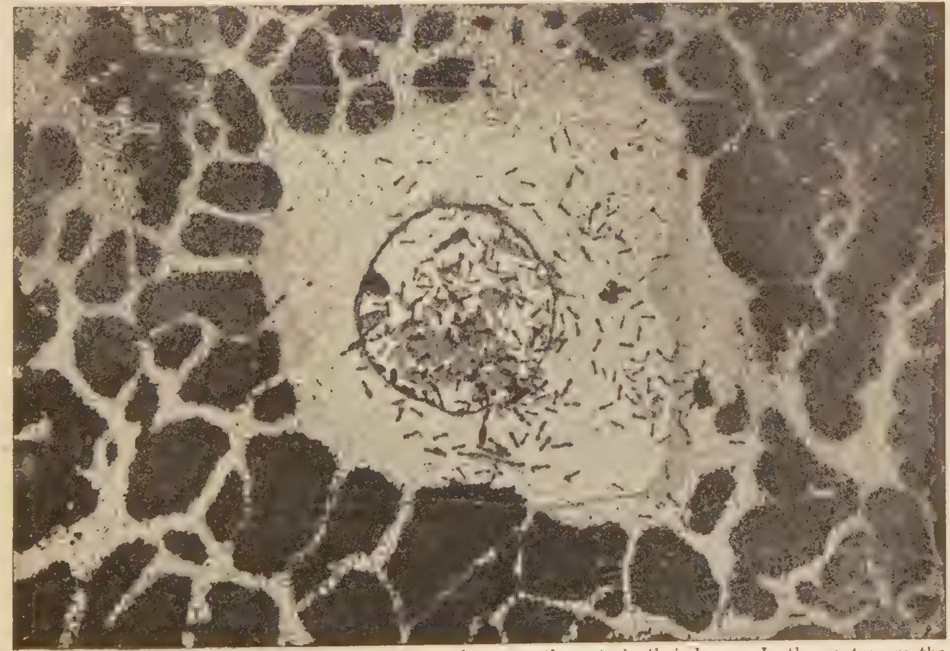
LIFE AND DEATH AMONG THE ANTS

Men call these ants' eggs, but really each is a chrysalis, with a baby ant inside ready to come forth.

These are the children of the red ant in the chrysalis stage. The red ant fires a volley of poison if touched.



Here are three chapters from the ant world. First we have some of the little insects that the ants keep as pets, just as we keep dogs and cats in our homes; next we have an aphis, the ant's cow, very much magnified; and last of all we have a tragedy; it is a dead queen ant surrounded by her mourning maids of honour.



Looking down into a nest which has been uncovered, we see the ants in their home. In the centre are the queen and her attendants, and also the baby ants and their nurses. The white spaces between the dark patches are the streets, or passages and tunnels, through which the ants make their way about their wonderful city the upper and lower lip, and also the antennæ. That is an ugly word with a diphthong at the end. It is the plural form of antenna, as larvæ is the plural form of larva, to which we shall presently come. Each antenna is very active and sensitive. It is supposed to be the organ by means of which ants "speak" to each other, by which they smell, and by which they hear. The antennæ are those little branching, horny threads in front of the head of the ant which we see constantly waving to and fro as the insect moves.

Some ants have poison stings; others have simply poison glands, and inject their poison into the wounds which they inflict with their jaws. The jaws of ants are remarkably strong. With these they can carry other ants bigger than themselves, and run away with weights which we could not lift if we were as small as ants. It is with this simple outfit that the ants work their wonders. A sluggish, weak-brained insect would be a very poor figure in the animal world with such capital, but the ant has a magnificent brain, and it is that which makes him such a king in the lower world.

HOW THE ANTS CARRY THE EGGS UPSTAIRS TO WARM THEM IN THE SUN

But how are the queen ant and her workers faring while we have been studying nests and their structure? The queen has begun to lay her eggs. The workers treat these with affectionate care, and their conduct shows us one of the reasons why they have so many galleries in their home. The eggs require a certain degree of heat and a certain degree of moisture. Now, if there were only one gallery in the city, it would become swamped in time of rain, and scorched by the sun in time of drought. When it rains the ants bring the eggs from the lowest gallery, if they are lying there, to one higher up; while, when the rain ceases, and the sun comes out, they carry them up to the top galleries, or even out into the open, so that they may get the full benefit of the sun.

The mother ant goes on laying eggs from time to time. The workers arrange the eggs according to their age. Those first laid are kept by themselves, while the second, third, and fourth batches are all arranged with the same care and order. The hatching of the eggs varies with the weather. It may take only fifteen days, or it may take three times as long. When the egg is hatched, there comes forth the larva, or grub, a little white, legless thing, looking like a small grain of wheat. The one grub we call a larva; two or more we call the larvæ.

THE ANT GRUBS THAT SPIN ROBES OF SILK FOR THEMSELVES

Well, the larvæ, now that we know them by that name, have to be fed by the worker ants, just as the larvæ of the bee have to be fed by the worker bees. The ordinary full-grown ants eat insects, any sort of flesh-food that they can secure, vegetable matter, the nectar from flowers, and so forth. Then they have the supplies from their dairies, to which we shall presently come. The larvæ take only liquid food supplied by the worker ants.

While in the larvæ stage, the future ant grows to its full size. Some ants live through the whole winter as larvæ, but others make their next change in the course of six weeks or two months. The next stage is the chrysalis stage. The larva, having been abundantly fed and having reached its full size, turns, like the baby bee, into a chrysalis. Some of the larvæ spin for themselves robes of silk; others remain naked. It is while they are in this stage that the larvæ are collected by men and sold as "ant eggs" for birds and gold-fishes.

During its chrysalis stage the young ant does not take any food. While its limbs are forming, it fasts. But all the while the worker ants are unwearying in their loving attentions. They carry the chrysalises into the sunshine, and back to bed at night, shift them from gallery to gallery, so that proper heat and moisture may be obtained.

HOW THE PERFECT ANTS ARE BORN, AND HOW THEY BEGIN TO WORK

Finally, when the time comes, the worker ants help the young ants out of their coverings, so that they may appear before the rest of the family, weak and trembling, but perfect little ants with hearty appetites, ready, as soon as they are strong enough, to be taught the duties of the home, of hunting, of avoiding dangers, and, generally, of helping to keep the home happy and prosperous. If the young ants are males or queens, they have wings, and must be prepared for their wedding day. If they are merely workers, then they set to work at once.

When we understand all about ants, we notice, in opening a nest, that there are many other creatures in the nest, living quite happily, which clearly are not ants. There are eggs, too, which are not ant eggs. Where do they come from? Those eggs are the eggs of the aphis, the little insect which we all know so well by the name of honey-dew.

THE LITTLE COWS WHICH THE ANTS MILK AND KEEP UNDERGROUND

The aphis is an insect which lives upon the leaves of plants, or on grass, and other growths. It feeds upon the juice of the plant on which it makes its home, and converts that juice into honey. Now, if there is one thing of which ants are more fond than another, it is honey. Therefore, they make prisoners of the aphides—aphides being the plural form of the word aphis. The little brown ant climbs high plants and bushes to get at the aphides on them. On coming to one, the ant gently caresses the body of the aphis, strokes it, and taps it, and causes the aphis to part with the honey that it contains. This the ant drinks, then passes on to another aphis and repeats the operation of stroking and tapping.

Our little yellow ant, though she looks so humble, is a lady of wealth and substance, part owner of flocks and herds of aphides. Hers are the aphides which live upon the roots of grass. These are the worker ant's cows, and she is not content to leave them in the open, where they run the risk of being preyed upon by other insects. The brown ants may mark off the aphides on certain bushes and plants as their own, and make tunnels in the plants and imprison the aphides in them, and fight other ants which go near them. But the yellow ants do better than this. They take the aphides bodily and carry them into the fortress below. How they manage to feed them we do not quite know. Perhaps they are wise enough to carry down food to them, unless the aphides derive sufficient nourishment from roots growing down into the city.

HOW THE ANTS FIGHT TO DEFEND THEIR WONDERFUL DAIRY FARMS

At any rate, the aphides are there, they live there and grow fat, and there they are milked by their owners, the little yellow ants. For that is what it really comes to: the ants milk them as our neat and nimble dairymaids milk our cows. The antennæ of the ant are the ant's fingers, and it is with these that she pats and strokes the aphis to make it yield the sugary fluid dear to the ant. Nor is this the most wonderful part of the dairy farm. The ants collect the eggs of aphides, and treat them with the same care that they bestow upon their own queen's eggs. They carry the eggs about from place to place, for warmth and shelter, and so forth, and they feed the young ones as they feed the baby ants. If danger comes, they fight bravely in defence of the young aphides, and some of the workers carry them off to a place of safety, while others continue the battle.

For several years Lord Avebury tried to get some aphides to live in his ant nests, but was not successful. At last he put near the nest some plants such as would be found near an ant nest in its wild state. The ants carried some young aphides to these plants, and soon Lord Avebury saw some aphis eggs on a daisy which was among the plants he had deposited. These eggs the ants did not suffer to remain on the stalk of the daisy.

THE PET INSECTS THAT THE ANTS KEEP FOR THEIR OWN AMUSEMENT

In October they carried them into their nest, and carefully tended them all through the winter months. In the March the eggs hatched; the ants took the young aphides up from the nest, carried them out into the open, and placed them on the daisy on which they had been as eggs. Thus they would be sure of a supply of aphis honey for the whole of the summer, as well as of a stock of aphis eggs ready to be hatched in the following spring.

This is one of the true fairy tales of Nature which we may all see acted before our eyes if we have the patience to search any plant in the garden to which the ant follows the aphis. Nor is this the only wonder that we may note. We may discover some other inmates of the ant's dwelling. Just as we keep dogs and cats and birds as pets, so the ants keep tame insects as pets. Insects which can be of no use to the ants are kept in the nests, and are played with and fondled by the ants as we play with and fondle *our* pets. If the visitors were not wanted, they would soon be killed, but there they are, as much at home as the ants, sharing their food and the games of their protectors, with every show of joy and happiness.

One result of the ant's love of honey is to be seen in an extraordinary insect called the honey ant, which is simply a living honey-pot. The worker ants keep these honey ants only to hold the honey that they collect. Full-grown honey-pots never leave the nest, but wait for the others to return home, and to take their honey from them. The honey is stored by the honey ants in their enormously swollen bodies, and when the less fruitful days come, the worker ants go to the honey ants and are fed by them from the rich store of honey collected in their bodies. The honey-pots live only for the service of their fellows, and are so dependent upon them that if they fall over they cannot get up unless they are helped. These ants live in Texas and Mexico and in Australia. This seems a rather rough-and-ready method of collecting food, but there are other ants which go to work more scientifically.

ANTS THAT GROW CROPS OF ANT-RICE AND STORE THEM IN BARNS

The harvesting ants collect grains of corn and the seeds of flowers, and store them in their underground barns. Once the seed is placed in the warm, moist earth, there is a danger that it may begin to sprout and grow. But the brilliant little ants know how to prevent this, though man could scarcely do so. They have some process which we, with all our wisdom, do not fully understand. If we take the ants away and leave their barns untouched, the grain at once begins to grow, and so is useless as food for the ants. If the ants remain in attendance, the grain does not grow.

The ant seems to let the seed sprout just enough for it to alter its composition and change its starch into sugar. Then it gnaws off that part of the grain which would form the root, carries the grain out into the sun to dry, and then carries it back again, ready to be crushed and eaten in the form of sweet flour, a good food to last all the winter.

Another ant, called the agricultural ant, does a still more wonderful thing—it actually cultivates its own crops! It lives upon a seed called ant-rice. This grows round about the ants' nest. But other things grow in the same rich soil. Against these other growths the ant wages war. It bites them all off close to the ground, and allows nothing but the ant-rice to grow. When the latter is ripe, the ant gathers the seed and carries it down into its granaries below the ground. It is said that the agricultural ant actually sets the seed from which the ant-rice grows, but this is doubtful, and we are not called upon to believe more than we *know* to be true.

THE FIERCE BATTLES OF THE ANTS, AND THE STORMING OF THEIR CITIES

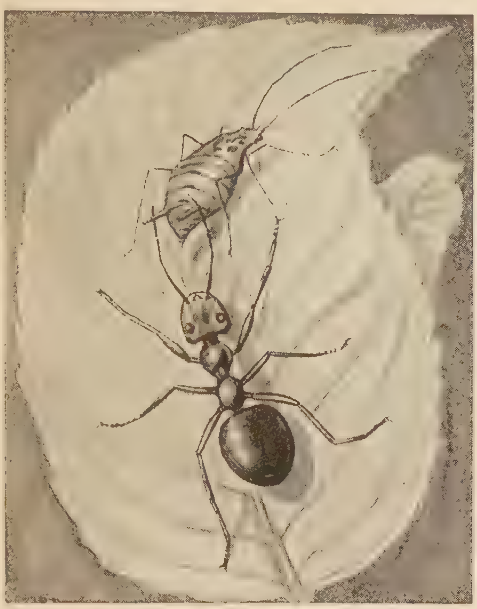
A point upon which we have no doubt is as to the wars and slave raids of the ants. The Amazon ants are terrible tyrants in this respect. They are big, and strong, and fierce, and prey upon ants weaker than themselves. On a certain day, that they seem to have agreed upon, they sally forth to another colony. They run along, smelling with their antennæ for the scent of their victims. When they have found the scent, they hurry straight to the nest, like a human army rushing on a city. The ants in the garrison get to know of the coming of their enemy, and the bravest come out to fight, while the others seize as many of the larvæ and chrysalises as possible, and flee with them. Their only chance of escape is to climb trees or tall stems of grass, for the powerful Amazon ant cannot climb.

Meanwhile, a fierce battle is raging. The defenders fight bravely for their own lives, for the lives of their little ones, and for their homes. But it is in vain. The terrible jaws of the Amazons are too much for them. The invaders rush into the city. They kill all the adult ants they can find, then seize the eggs and larvæ, and dash off with them. Stragglers bravely follow and try to snatch the larvæ back again. A few succeed and dart up stems of plants, bearing eggs or larvæ with them, but only a few do this. Victory lies with the Amazon ants.

HOW THE AMAZON ANTS MAKE ANT SLAVES DO ALL THEIR WORK

When the stolen children come to life, they are slaves in the Amazon citadel. Born to slavery, they do not seem to mind their hard life, for they have never known what it is to be free. There is not an ant of their species in the nest which was born free—for all the full-grown ones have been killed. The slaves now do all the work of the

ROYAL ANTS AND AN ANT MILKMAID



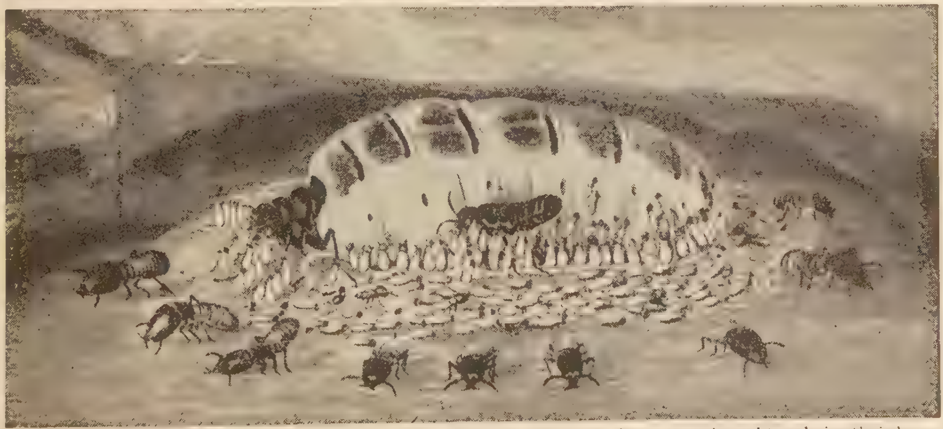
The aphis, or green-fly, is the ant's cow, and here we see, magnified, an ant actually at work milking its cow.

This great mound is the work of termites, commonly called white ants, which are destructive foes of men.

This worker ant is born without wings. Its antennæ may here be seen.

This queen ant, on returning from her wedding tour, will bite off her wings.

The male ant passes one day in the sunlight, and then falls down and dies.



The termites, or white ants, as we wrongly call them, do great damage, but we are bound to admire their home plan. The great queen in the centre is vastly larger than the workers and courtiers which surround her, and she is almost worshipped by them. She has courtiers and workers, and an army of soldiers to defend her home.

city. The big Amazons depend entirely upon their slaves. They have even to be fed by them, and, when it becomes necessary to change the home for a new one, have actually to be carried by the humble servants whom they stole. They can kill and capture, but they would starve in the midst of plenty unless their slaves fed them.

THE BLIND ANTS THAT TRAVEL BY NIGHT AND EAT SNAKES AND PIGS

There are several kinds of these slave-making ants, and the way they fight is terrible. Some of them besiege a rival colony just like human soldiers. They surround the city, break down its walls, and make their way in as if they had all the implements of war.

It is not against ants only that ants make war. The terrible Driver ants of Western Africa are one of the species that make war on man. They are called Driver ants because they drive everything before them. Moving in countless swarms, they devour everything living and dead that an ant can eat. The amazing thing is that they are blind, yet find their way with unfailing sureness. Travelling chiefly at night, they march in a column, with the large ones on the outsides and the smaller in the centre. They enter poultry-runs and eat the fowls, they raid pig-styes and eat the pigs. They kill every fly and spider in the house. They kill big snakes in the open; indeed, the big snake has such a horror of these ants that before feeding he is careful to look about him to see if any are on the prowl. When he has eaten heartily, the snake must go to sleep. In that condition he falls an easy prey to the ants. But, sleeping or waking, he is always subject to attack.

The fact that they completely clear a house of every sort of vermin they meet on the way is the only thing that makes these terrible pests at all endurable by men. If they have to travel by day, the Driver ants construct tunnels as they go, building with marvellous skill and speed.

HOW MEN ARE DRIVEN FROM THEIR HOMES BY ARMIES OF FIERCE ANTS

Heavy rains may flood their homes, but the Drivers cling together in masses as big as a cricket-ball and float to safety. They can cross streams by making bridges of their own bodies. They are good scavengers—most ants are—but they take so much of the good with the bad that they are a pest and a terror to man, who must give up his house while the Drivers are on the war-path.

The same remark applies to ants such as formerly troubled the island of Grenada. They descended from the hills like torrents, we are told, and the plantations, as well as every path and road, were filled with them. Rats, mice, and every kind of reptile were consumed by them, and birds, on alighting for food, were overcome and devoured. Streams of water failed to check them. The leaders rushed blindly into the water; myriads more followed them, till a bank was formed of the dead bodies, sufficient to dam up the water and allow the rest to pass over in safety. Fire was tried without success. They rushed into it in such masses as to put out the flames. A reward of $100,000 was vainly offered for their extermination. At last there came a frightful storm which tore up the homes of these ants and drowned them out, and so freed the island of a plague of little insects which for long had been too powerful for man.

WHITE ANTS THAT BUILD TALL MUD HUTS AND DEVOUR EVERYTHING THEY FIND

Men are still plagued by ants. The white ants, or termites, are among the worst. They are really not ants, and belong to a different order of insects. Bigger than ants and possessing more terrible jaws, they are called ants because they live in enormous nests like ants. Their homes are like great mud huts, but full of underground galleries. The domes are as much as twenty feet in height and one hundred feet across, and so strong that a big man can jump on them without breaking them down. The termites can bite through a man's thick clothing, and inflict most painful wounds. They eat almost anything, and destroy clothing, boots, furniture, trunks, books, papers, anything and everything that a man prizes, unless it be of mineral or metal.

This does not exhaust the list of ants and their ways, but it exhausts our space, and should serve to prove that the wonderful skill and intelligence of ants, their virtues and their vices, do seem to place them very close in the scale to the best of men and the worst of men.

The next story of Nature is on page 2983.

A RACE FOR THE LIFEBOAT

CONTINUED FROM 2806

A LITTLE girl named Margaret, who was born and bred in a fishing village on the Scottish coast, was sleeping alone with her mother one summer night.

While the dark hours wore away, the wind rose, and the waves grew big and tossed their manes as they came dashing on to the shore. The mothers and sisters in the fisher cottages woke and started at the sound. They knew that it meant danger to their dear ones away in the fishing-boats. As morning dawned, they stood on the shore straining their eyes in search of sails. While they waited there in trouble and fear, they saw, to their dismay, a ship heaving up and down on the waves, drifting nearer and nearer to the sharp rocks, and helpless to save herself from destruction.

The little crowd of women, children, and feeble old men on the beach stretched out their hands helplessly towards the men in the rigging. There was not a fishing-boat left on the shore; all the strong men and boys were away fishing, and who among that group of people could have launched a boat in such a sea? Yet it was heart-breaking to watch men perish before their eyes. "If only the lifeboat men could know!" cried one woman. Little Margaret heard her, and a bright thought came to her. Eagerly she asked if the ship could hold together while she ran for the lifeboat four miles away along the coast. Someone shouted that she would not be able to cross the stream, but Margaret was off. Four miles, and that flooded burn lay before her! It raged like an animal; its banks were flooded; and, worst of all, the small plank bridge had been carried away in the rushing flood.

Into the water Margaret plunged. It nearly carried her off her feet, and she gasped and shuddered as it chilled her through and through. Then rallying all her strength she forced her little body against the current, and inch by inch pressed on. And so the worst was over, and she was out of the stream.

At last the tottering feet of this brave little maid reached the village street, and she had just strength to cry out that there was a ship on the rocks before she lost consciousness. But she had done her work. Kind womanly hands clasped her, and the crew of the lifeboat were quickly in their places. The boat was launched and hastened to the scene of the wreck.

Margaret's deed was not in vain, for the lifeboat was in time, and rescued the crew of the ship on the rocks.

THE BOLD HERO OF THE MOUNTAINS

All countries cherish the name of some patriotic man who has fought for the liberty of his native land. Just as Wales has its Llewellyn, Scotland its Wallace and its Bruce, Italy its Garibaldi, so the Caucasus has its Schamyl, who, for more than a quarter of a century, struggled to keep the wild mountain land of his birth free from Russia's iron grip. He was weakly as a child, but his physical strength was developed by outdoor games and sports, so that he grew up sturdy.

Schamyl was absolutely fearless, and such a youth of his word, that, when he found remonstrance without result in curing his father's drunken habits, his oath to kill his parent if he again transgressed brought the father to his senses, and to the end of his life he abstained altogether from alcohol, knowing that Schamyl would carry out his threat.

When Schamyl was twenty-six years old, in 1824, he began his long fight against the Russian generals who were sent to subdue the land. He was a born leader, courageous in attack, skilled as a strategist, and clever in retreat. Many stories are told of his hairbreadth escapes from the Russians. Once his little band was surrounded by their enemies. If they could not fight their way through the bayonets of the Russians, they must either starve or be cut to pieces, for they knew not the word "surrender." Schamyl, who was ever the foremost and the boldest in attack, galloped alone through the enemy's lines, and reached in safety his mountain fastnesses, as we see in the picture. He was the only one to escape with his life, and his pious Mohammedan countrymen believed the angel Gabriel specially protected him. During another fight Schamyl killed three Russians, but was himself pierced through by a bayonet. Yet he slew his assailant, and got away as by a miracle. He was then chosen chieftain and ruler of the Eastern Caucasus by his compatriots. Little wonder that his people rallied to him as to a prophet who was born to deliver their country.

A mountain fortress long held by Schamyl was at last captured by the pick of the Russian troops, and again he was the only man to escape. It is said that he let himself down the steep rock by a rope to the river below, boarded a raft, and thus got away. Many generals were sent against Schamyl, but he eluded them all, and time after time rallied his countrymen to his standard. One general died through shame at being conquered by such a small band of mountaineers. Russia's attention was for a time diverted by the Crimean War; but that over, new efforts were made to overcome Schamyl and his brave countrymen. The end was inevitable, for Russia's resources were enormous compared with Schamyl's. The latter took refuge in a little fortress on a hill in Daghestan, and there, when all except forty-seven of his men were killed, seeing that, even if he did escape, there were no longer any patriots to rally, he submitted.

Schamyl was not a wild brigand, but a wealthy man of culture and high character, who ruled with justice and ability, was merciful to the Russian prisoners, and fought for love of his country during many long weary years.

THE NEXT GOLDEN DEEDS ARE ON PAGE 3009

AMERICAN SONGS AND SONG WRITERS

FROM early days our American poets and composers have shown remarkable aptitude for creating popular songs. They have brought together words and music which the public have welcomed and sung with delight because they expressed what was in the hearts of all men and women. More than once our songs have touched the hearts of other nations too and have gained a world-wide popularity. Although some critics have called them crude, some of the greatest composers in the world have recognised genius in their very simplicity.

Music has been called "not food for the soul but wine." A stirring song lifts the spirits of those most exhausted and depressed, and helps them to fresh courage. When some years ago need arose for more overseers of the labourers on the Panama Canal, overseers who could sing and influence the men to sing while at work were given the preference. For it had been found that the cheering influence of singing kept the men from homesickness and helped them to do better work.

However beautiful they may be songs which deal with peculiar or individual experiences instead of with those which everybody knows and shares, never stir great enthusiasm. To be popular a song must draw people together with a sense of brotherhood. It must express some universal feeling simply and directly.

The Concord Hymn by Ralph Waldo Emerson, sung at the completion of the Battle Monument at Concord on the anniversary of the battle of Lexington is a beautiful poem. But because it is the work of a man somewhat withdrawn from the mass of his fellowmen it lacks this necessary quality. Its patriotic theme and its literary beauty have not been enough to make it popular.

A sentiment which comes to everybody as he or she grows older is love of what has been familiar in childhood. The first successful American songs were mostly of this character. One such as The Old Oaken Bucket, written in the summer of 1817 by Samuel Woodworth, the son of plain people, and a man of little education, but of strong, true feeling. Songs like his; like Roll on, Silver Moon, by Joseph Turner of Charlestown, Mass., who set his words to an English tune, are what most appealed to the popular fancy before the crisis of war aroused demand for music impelling more stirring emotion.

SONGS OF SENTIMENT AND HOME

Of all the songs inspired by love of home, Home, Sweet Home has been the most enduringly popular. Like many another favourite, it was written for the stage. Its author, John Howard Payne, was living at that time in Paris. He had been sent there by an English theatrical company to find and adapt French plays and operas for the English stage. One opera which he thus made over and in fact largely composed was Clari, and for its homesick heroine he wrote his famous song. He himself was lonely and homesick for his native America, and the words express his mood of love and longing, the mood of all exiles from what is dearest and most familiar. But for this song John Howard Payne would now be forgotten. Yet in his own day he was a celebrity for other achievements, and he became one very young.

He was born in New York June 9, 1791, of fine old New England stock. Most of his childhood was spent in Easthampton, L. I., where the home he immortalised may still be seen. He was an uncommonly handsome and gifted boy, with a strong desire

Copyright, 1911, by M. Perry Mills.

to go on the stage. Unknown to his family, the young stage lover started and conducted a little theatrical paper called The Thespian. The New York Evening Post decided to reprint one of The Thespian's articles, and this led to acquaintance between young Payne and Mr. Coleman, editor of the Post. Mr. Coleman was astonished to find the able writer a lad of only fifteen. He became interested in him and with another gentleman raised funds to send him to Union College, Schenectady, N. Y. Payne still desired to go on the stage and finally money troubles caused his father to consent. For a few years the youth had a brilliant success as an actor both here and in England. Then strangely enough his talent flagged and changed. Some power went out of him which never returned. He finally withdrew from the stage and supported himself by writing, adapting, translating, and in various ways belonging to stagecraft.

Like many another man of talent, he was lacking in practical sense. However much money he was making, he never managed to save for the future. He never could be thrifty. He was in money difficulties, when through the influence of friends he was appointed American Consul at Tunis, where he died in 1852.

The world went on singing Home, Sweet Home, and those who had known its author felt that he was entitled to at least a grave in his native land. Thirty-one years after his death Mr. W. W. Corcoran had the poet's body brought from Tunis to Washington, D. C. The President, his Cabinet and a body of soldiers escorted it to Oak Hill Cemetery, where it was laid finally to rest.

NEGRO MELODIES

Our American song-writers have the distinction of having created a unique form of popular song, negro melodies. That these have a singular charm has been acknowledged the world over. Sometimes plaintive, sometimes rollicking, they are characterised by simple, tender and appealing melody. Most of them appeared originally in Minstrel Shows, a form of entertainment altogether American and for many years immensely popular, both before and after the Civil War. They were a curious mixture of buffoonery, local and contemporary jokes, and these delightful songs. Many of the best known — Way Down upon de Swanee Ribber, Old Uncle Ned, My Old Kentucky Home, Old Black Joe, Old Dog Tray, and many others — about 160 in all — were written by a Northern man, — Stephen Collins Foster, of Pittsburg. It is sad that a man whose genius has for so long been a source of good and pleasure should himself have been unhappy and unfortunate. His career was wrecked by intemperance. His life began in a most promising way, for he was the youngest and well-beloved son of cultivated, well-to-do people. He was born on July 4, 1826, to the strains of The Star Spangled Banner, which was being played on his father's lawn by a Pittsburg band. Stephen had every advantage of education. From a little child he was a musical prodigy and composed songs. His first published song, Open Thy Lattice, appeared when he was sixteen. From that time he became increasingly popular. His songs earned a great deal of money but it was for other people. Stephen remained poor. Two songs, Oh Susanna, and Uncle Ned, he gave to a friend, who made $10,000 out of them.

The Christy Minstrels had a great reputation in his day and nearly all Foster's songs were written for them. Old Folks at Home has proved the most lastingly popular. It has been widely translated and is known the world over.

After his death in Bellevue Hospital as the result of an accident when he was thirty-eight, Foster was carried to Pittsburg and buried beside his parents.

A NORTHERN WRITER WHO WON SOUTHERN FAME

Another songster who won love and fame but not money was Daniel Decatur Emmett. He wrote many popular songs and one very famous, Dixie. He was a well-known minstrel himself, a clever actor and singer, loved as "Old Dan Emmett" by his comrades on the stage. In spite of his great popularity he is said to have earned only about $600 in all as a song-writer. Like Foster, he too began to write when very young. Old Dan Tucker appeared when he was fifteen. He was a Northern man, in sympathy with the Union cause, which makes it an odd fact that he should have written Dixie, the great war song of the Confederacy. He wrote it in 1859 for the well-known Bryant's Minstrels, of which show he was then a member. "I wish I was in Dixie" was a much used phrase with show people forced to travel in the chilly North in the winter instead of in the balmy South. It occurred to Emmett on the blustering autumn day when he had set himself to write a new song for his show. He was in New York, and there Dixie was first sung. A year and a half later it was introduced into the opera Pocahontas, and first sung in the South at the Pontchartrain Theatre in New Orleans. A company of Zouaves marched on the stage singing it, were received with great enthusiasm, and it immediately became popular throughout the South, the favourite tune of the Confederate army. When many years later Mr. Emmett visited the South as the author of Dixie, he received an ovation everywhere. The friendly old man enjoyed the attentions heaped upon him but soon had enough and was glad to return to his little home at Mount Vernon, Ohio. There in a plain cottage, busy with his chickens and his garden, he lived very simply and contentedly until his death in 1904 at the age of 89.

AMERICA'S MOST POPULAR DITTY

Nobody knows just how or why Yankee Doodle became our national ditty. We know that our poverty-stricken, ill-equipped soldiers cheered their spirits by singing it during the weary marches of the American Revolution. The story goes that a certain Dr. Schuckburg, an army surgeon, is responsible for introducing to the army as a famous military air of England what really was an ancient nursery rhyme. His joke was more successful than he could have foreseen. It found favour with our ragged regiments. The rollicking verse joined to the melody suited the rough and ready spirits of the rank and file. The tune has won high favour from no less an authority than the famous pianist Paderewski. From Rubenstein, too, who played it with variations while in America. Many different words have been set to it. After the original doggerel, the most noteworthy version is perhaps the Battle of the Kegs, written by Francis Hopkinson, father of the Hopkinson who wrote Columbia. This poem commemorates a well-known incident of the Revolution, an attempt by David Bushnell of Connecticut to blow up the British fleet at the mouth of the Connecticut River by floating kegs of powder down on them. The attempt failed through the premature explosion of one keg.

From time to time more dignified words have been written to the tune of Yankee Doodle but none have succeeded in replacing the first doggerel in popularity. Yankee Doodle, as we know it, has been aptly called "our national Mother Goose, the nursery rhyme of the American Army."

THE STAR SPANGLED BANNER

A sentiment which we all share is love of country. Naturally this stirs us most in periods of national stress and struggle. When war clutches the land our singers have always burst forth in patriotic song. Our war songs have come from the hearts of their writers. When Francis Scott Key, then a handsome and clever young lawyer, wrote The Star Spangled Banner he could not have foreseen that it would become the National Anthem of his native land, and that every night, when the flag is lowered at sunset, at every fort and on every flagship of the navy it would be played by the military bands. All night Mr. Key had listened to the bombardment of Fort McHenry near Baltimore. If the fort fell, he knew that Admiral Cockburn, Commander of the British Squadron, would proceed to attack Baltimore. The day before Mr. Key, in an American vessel which our government had placed at his disposal, had visited the British flagship to obtain the release of a friend who was prisoner of war. This was granted, but the two, with one other American, were detained on their vessel for fear that if allowed to land they would reveal the British plans. While daylight lasted the anxious Americans watched the flag. When dawn revealed it still floating above the fort, they knew the attack had not succeeded. Then, in his joy of relief, Key drew an old letter from his pocket and on its back wrote the first stanza of The Star Spangled Banner. He finished the poem later in the day, when his vessel had been allowed to land. It was first printed as a hand-bill enclosed in a fancy border. One of Key's friends, Judge Nicholson of Baltimore, saw that the tune of Anacreon in Heaven, an old English drinking song, fitted the words, and the two were quickly united with astonishing success. Military bands seized upon the new hymn and it was played upon every occasion. From that day to this its popularity has never flagged. The old flag which prompted the poem, much torn by shot and shell, much cut down from its original size, still exists. It was stoutly made to withstand time by Mrs. Mary Pickersgill.

HAIL, COLUMBIA

Like so many of our songs, Hail, Columbia was written for the stage. It was first sung at an Actor's Benefit in Philadelphia in 1798. The actor, Gilbert Fox, for whom the benefit was given, anxious to have the occasion a success, asked a clever friend, a young lawyer named Joseph Hopkinson, to write a patriotic song. Mr. Hopkinson wrote the poem and set it to the tune of the President's March. The tune, which greatly helped the popularity of the song, is said to have been composed by a Philadelphia musician of German descent named Roth. It was received with great favour, the big audience joining in the singing. People flocked to hear it. This popular melody is said to have had a helpful influence on public affairs. There was at the time some danger that the United States might interfere in difficulties then increasing between France and England. Hail, Columbia awakened home pride and patriotism and a feeling that we had problems enough of our own without interfering with those of other nations. Philadelphia was then our National Capital, and hearing of the stirring new song, President Adams and his entire Cabinet went to the theatre to hear it.

OUR NATIONAL HYMN

America, so well known and loved by American school children, was written in February, 1832, by Samuel Francis Smith, a graduate of Harvard College and at the time a student in the Theological Seminary at Andover, Mass. The young man was a passionate lover of music. He was twenty-three when he wrote American words for an air which he had found in a collection of German melodies. The result was America, and though he lived to be eighty-seven and wrote other hymns and songs, he never equalled its great success. It is said to have taken him only half an hour to pen the words so familiar to us all.

Many legends have sprung up about one of our most familiar songs — John Brown's Body. We know that the tune belonged originally to an old camp meeting hymn. Some investigators claim that the John Brown meant was an ungainly Scotch soldier, whom his comrades loved to tease. His regiment, the 12th Massachusetts Infantry, was the first to sing the song, of which there have been many variations. The soldiers and the public generally have always loved it and refused to substitute finer words or poetry for the cruder doggerel. William Steffe, writer of many much loved hymns, is said to have composed the music.

THE BATTLE HYMN OF THE REPUBLIC

Mrs. Julia Ward Howe's great Battle Hymn of the Republic was originally intended to supply nobler words to the John Brown tune. She wrote it at the request of James Freeman Clarke, who went with her and others to visit an army post near Washington. She heard tired soldiers singing John Brown's Body as they returned from a skirmish, and while the wounded were being carried to their pallets, the stirring strains took possession of her and kindled her ready patriotism to lofty expression. A woman of genius, of fine character, of highest ideals for her country, she put her best of heart and mind in her great poem. The Battle Hymn of the Republic ranks as the finest song of the Civil War.

MARCHING THROUGH GEORGIA

Marching Through Georgia is one of our greatest war songs. The man who wrote it, Henry Clay Work, had very little technical education in music. In his patriotism he found inspiration for the stirring words and music which many a time were to cheer and help along weary, footsore soldiers. Oddly enough, General Sherman, the leader of that famous march, is said to have always felt a great dislike to the song.

Another war song, so beloved and stimulating it was often ordered sung just before the men went into battle, was Tramp, Tramp, Tramp, the Boys are Marching, and the stirring song "The Battle Cry of Freedom." Unlike Work, its author, George F. Root, was a musical scholar and teacher of music, and in his day one of the first authorities in musical matters in this country.

An ardent young Southerner, James Ryder Randall, impatient that his native state should delay in joining the Confederacy, wrote Maryland, My Maryland, considered one of our finest war songs and the best beloved by southern people. He wrote it at a single sitting in the dead of an April night in 1861, in New Orleans, where he was then employed upon a newspaper. The words were published in the New Orleans Delta, received with great favour, and very soon set to music. A young lady, Miss Jennie Cary of Baltimore, had the honour of establishing My Maryland as an army song. She set it to a German melody, and sang it upon the occasion of a serenade given her sister at Fairfax Court House, Virginia, by a body of Gen. Beauregard's troops. Another well loved song of the Southern Confederacy was the Bonnie Blue Flag. There is some doubt whether it was written by Henry McCarthy, author of other songs, or by Annie C. Ketcham of Kentucky. We know that it was first sung at the Varieties Theatre in New Orleans in 1861.

COLLEGE SONGS

The college song, whatever its rollicking form, is apt to have something of academic flavour. Notably so is the case of one of the most famous — Fair Harvard — written by Samuel Gilman. He was an alumnus of the great University of which he sang. Born in Gloucester, Mass., in 1791, he became a Unitarian clergyman. He was forty-six years old, living in Charleston, S. C., when he wrote the song.

The public had to some extent forgotten a once very popular song when the great success of Du Maurier's story, Trilby, both as novel and play, in which this song, Ben Bolt, was introduced, brought it back to favour. The author was Dr. Thomas Dunn English, a physician, and a reserved and scholarly man. He wrote his one famous song by request as a poem for the New York Mirror, and was considered sufficiently paid by the honour of having it printed. The words appeared in 1843. It was quickly perceived that they were well adapted to singing and various tunes were tried. The first was discarded. Another composed by Dr. English was not successful. Finally a German melody with some adaptations was found to fit the words and the new song became widely popular in America and England. Dr. English did not greatly admire it himself.

HYMN WRITERS

America is justly proud of her hymn writers — of the Cary sisters, Dr. Mühlenberg, Bishop A. C. Coxe, and many others who were able to voice the religious longings and consolations of which all the world knows something.

These cannot be made to order. Critics have declared that not one of our patriotic airs is quite worthy of being the national hymn. The New York National Hymn Committee, its members prompted by patriotism and equipped with musical knowledge, was formed in the hope of calling forth something splendidly adequate. Twelve hundred manuscripts were submitted — much good painstaking work — but not one song worthy its high purpose.

A FAMOUS CASTLE & A MIGHTY ALPINE PEAK

The quaint old castle of Chillon, on the Lake of Geneva, has become world-famed through Lord Byron's poem "The Prisoner of Chillon," some lines from which we find in another part of this book. But, apart from its history, which dates back 1,000 years, the castle would be famous because of the superb beauty of its surroundings.

The Matterhorn, which we see towering before us in this picture like a mighty obelisk, is the most impressive and inaccessible of all the Alpine peaks. It rises 14,837 feet above the sea-level, and was first ascended, in 1865, by a party of four Englishmen with three guides. In the descent, however, three of the travellers and a guide were killed, owing to the breaking of a rope. Nestling below, we see the tiny little town of Zermatt.

Typical scenery in the Swiss Alps, **showing the Jungfrau**, one of the grandest peaks in Europe.

SWITZERLAND OF THE SNOWS

CONTINUED FROM 2860

"Boys and girls come out to play" is the standing invitation from the little central country, Switzerland, to the nations of the world. They respond very willingly, thousands and thousands of them, not only from the neighbouring countries of Germany, France, Italy, Austria, but through them—for Switzerland has no sea-coast—from Holland, Great Britain, and the United States; from Russia, and everywhere else.

We have not far to look to find out the principal reason why this small country, about half the size of Maine, is so attractive. The posters of the railway and tourist companies, who make it possible for tired people to go quickly and cheaply to "play" out of their own country, as well as the advertisements of some of Switzerland's chief industries, all give us a broad impression of grand scenery, very different from that usually before the eyes of dwellers in the cities and country parts of our own land. Dazzling white mountains stand out against the bluest of skies; dark forests contrast with bright green meadows down the hillsides, and reach to the shores of wide lakes of ever-changing colour, into which pour the foaming white rivers.

As we look more closely at these striking and beautiful features on the face of Switzerland, we shall realise what an influence the relief of the country has had in shaping its story. It can well say "My face is my fortune," not only because its beauties year by year attract visitors, who spend in it an enormous amount of gold, but chiefly because its protecting, invigorating mountains, its fertile valleys and useful lakes, have enabled the Swiss themselves through the centuries to develop into a sturdy, free, industrious nation. There are to-day about three and a half millions of Swiss—much less than the population of New York; but they live independent in the midst of powerful neighbours.

Before glancing at the story of the past—which is chiefly the story of their relations with these immediate nations—let us try to get a clear idea of Switzerland itself with the help of a relief map, if possible, such as those in the educational departments of our great museums. We have already seen that the great solid mass of the Alps, the highest land on the Continent, stretches across Europe from the Rhone to the Danube. Its western end is in France, where, south of Lake Geneva, the highest peak of all, Mont Blanc, rises over 15,000 feet. Its eastern end is the Austrian Tyrol, of which we see pictures on page 2859. It is the central part of the great highlands that cover more than half of Switzerland with grand ranges of mountains, the tops of many being above the line of perpetual snow. Amongst others there are Monte Rosa, nearly as high as Mont Blanc, and the Matterhorn, near where Switzerland touches Italy, and the Jungfrau and many more about forty or fifty miles north of the frontier.

THE BLUE RIVERS OF ICE THAT SLIDE SLOWLY TO THE SEA

Valleys separate the ranges and groups of mountains ; some a mere cleft in the bare rocks ; some wider, and green with grass and gorgeous with wild flowers in spring and summer ; others again are filled with deep, dark forests.

In nearly all the valleys are leaping and dancing streams. Very high up the rivers only slide and crawl a few feet in a year, for they are frozen hard. These glaciers, or rivers of ice, some of them twenty miles long, are amongst the great wonders of the Alps. Their surface is usually very rough and heaped up, like waves suddenly frozen hard. The edges of the ice, seen in the great cracks called crevasses, are of a vivid blue colour, as they are also at the end of the glacier, where the warmer air forces the ice king to loose his grip, and the water escapes on its journey to the sea.

Comparatively few of Switzerland's visitors climb over the glaciers and up the highest peaks. It needs strength and endurance to climb in the intense cold, roped to guides, who show the way and cut steps when needed in the ice. But those who do go enjoy it amazingly, so fine is the pure air, so grand the immense views and the solemn stillness and beauty of the white world.

THE GREAT WHITE WORLD BATHED IN GLORIOUS RED AND GOLD

It is not always white, though, for at sunrise and sunset in clear weather both sky and snow are bathed in glorious colour—rosy red and gold. The stillness, too, is often broken by the thunderous roar of avalanches—masses of snow that slip down the mountain just as snow does off a roof, overwhelming any life that may be below.

Between the High Alps and the plateau, or high plain, of Switzerland, there is a beautiful mountainous district which reminds us of Scotland, with its picturesque rocks and pine-woods, heathery moors and mountain lakes. In many of the valleys, and round the lakes of Thun, Brienz, and Lucerne, thousands of visitors find villages in which to stay. There are even hotels at the tops of some of these mountains, such as the Pilatus and the Rigi, with wonderful railways which climb up the steep mountain-sides from the valley below.

In the plain of Switzerland, which lies between the Alps and the Jura Mountains to the north, are little wooded hills and green slopes, wide fields shaded with fruit-trees, or richly cultivated with crops of many kinds. The country is now covered with towns and villages ; everybody is busy, either working in the fields or in the towns at various manufactures. At the south-west of the plain lies the great Lake of Geneva, so large that it takes a fast steamer two hours to go from one end to the other. Geneva is at the south corner near France. At the north-east of the plain is Lake Constance, whose further shore is in Germany. Between these two largest lakes are many smaller ones, such as those of Neuchâtel, Bienne, Zürich.

THE RIVER RHONE THAT RISES IN A BEAUTIFUL BLUE GROTTO OF ICE

All the chief towns of Switzerland lie round the lakes, or on the rivers of the plain. These rivers rise within a few miles of each other in a great central mountain mass near St. Gothard, and run in widely different directions. There is the Rhone, rising in a beautiful blue grotto of ice, at the end of the Rhone glacier, and running along a wide and fertile valley to Lake Geneva. It is most interesting to watch the different colours of the water of the river as it pours into the lake. Soon after leaving the other end of the lake, the Rhone passes into France on its southward journey to the Mediterranean.

The upper Rhine takes a north-easterly course to Lake Constance, and after leaving it at the further end, makes the wonderful falls at Schaffhausen, and later, turning north at Basel, becomes the German Father Rhine. The river Ticino rises near the Rhine, and flows down the south slopes of the Alps, leaving Switzerland as it passes through Lake Maggiore to join the Po, the great river of North Italy.

The Inn, which we have already seen at Innsbruck, on page 2859, on its way

HEROES OF THE SWISS FIGHT FOR FREEDOM

At the beginning of the fourteenth century the oppression of the Austrian rulers had become so unbearable to the Swiss that three brave patriots determined to resist. They called together a few trusty countrymen, and in a lonely meadow at Ruetli, with none looking down upon them save God and their rugged Alpine peaks, they took a solemn oath to stand together and preserve the freedom of their nation. This is a landmark in Swiss history.

One of the Swiss patriots who took the oath at Ruetli to fight for freedom was William Tell, whose story we read on page 1674 of this book. He was compelled by a brutal Austrian governor to shoot an apple placed on his little son's head, and the rejoicings of the people when Tell succeeded in transfixing the apple without hurting the boy were very great, as seen. Whether or not the story is true, it shows the spirit of the Swiss people.

to join the Danube, rises not far from the Rhine. Another important Swiss river is the Aar, which rises near the Rhone, and flows through Brienz and Thun, and then in a winding course to the Rhine past Schaffhausen. Berne, the capital of Switzerland, is on the Aar.

MEN WHO LIVED ON PLATFORMS BUILT IN LAKES, TO ESCAPE FROM WILD BEASTS

Now, in the Museum of Berne there is a deeply interesting model of a settlement built on a lake. It shows us how piles were driven into a soft shore where the water was shallow, how a floor of wood was fastened above the piles, and how, on the floor, the huts were built of wood and hurdles, and roofed with rushes. There was a gangway easily removed to connect with the shore. As far as we know, the people who lived in these lake-dwellings were the earliest to settle in the country. At any rate, it is believed that their times date back to a thousand years before Christ. Life was very wild then in Central Europe, and it is supposed that men made their homes in this fashion to get out of the way of wild animals and their wild neighbours, just as tribes in Africa do to-day.

We should know very little about the lives of these folk if their possessions had not been preserved by fire. This sounds strange, but when the flames were consuming these old homes the remains became crusted with charcoal as they fell into the soft bed of the lake beneath, and so have lasted safe and perfect to these days. What a fine time the lake-dwelling children must have had, playing about in the boats, or taking a run on the shore, or sitting round the cosy fireside at evening, when the day's work was finished.

RELICS OF THE SWISS LAKE-DWELLERS THAT MAY BE SEEN IN LONDON TO-DAY

In a large case in the Prehistoric Room in the British Museum, labelled "Swiss Lake-Dwellings," we can see the nets, the blackened stones, and raspberry-seeds and ears of corn, the fishing boat and hooks, the pottery, small mugs for the children, and tiny bracelets for their arms, amongst many other things that make this far-away time quite real to us. These settlements have been found in the lakes of the plain, such as those of Geneva, Neuchâtel, Bienne, and Zürich. The next race of men who made their home in the plain of what we now call Switzerland were the Celts, in many ways like those who lived in Britain. They were very brave and warlike, fond of ornaments and fine armour, and were led by Druid priests. Gradually they were subdued by the all-powerful Romans, who adopted the same plans as they did later in Britain. Fine roads were made across the high passes of the Alps from Italy to the towns that rose up in the plain under Roman rule.

The chief roads were over the St. Bernard Pass and the Julier Pass—where there are still two milestones of the emperor in whose reign Christ was born. In the museums of all the large towns of Switzerland are many remains of the conquerors of the Helvetians, as they called the chief of the Celtic tribes. Along the beautiful and sheltered shores of Lake Geneva the rich Romans had fine villas, as they had in the Isle of Wight and other favoured spots, and to this day there are ruins of temples and other buildings belonging to the Roman times.

HOW VARIOUS TRIBES WERE BLENDED TOGETHER TO FORM THE SWISS NATION

East Switzerland was never so thoroughly Romanised and subdued as the western part. Hence, when the Teutonic or German tribes succeeded at last in settling in the country—the power of Rome having died out—the Alemanni in the north-east entirely absorbed the Celts who lived there, and who had but little power of resistance, and planted a true German people, with their own laws, language, manners, and customs. With the Burgundians—also a German tribe, who settled in the south-west—it was different. While they brought fresh vigour into the country, they were influenced in their turn by the civilisation of the Romanised Celts, and were gradually blended with the earlier settlers, thus forming a new people, the foundation of whose speech was Latin. This was the beginning of a German speech and a Latin speech, which developed into French, being spoken side by side in the little central country. There is no Swiss language to-day. The larger eastern part still speaks German, like the country it borders on, and the smaller western part,

SWISS TOWNS AT THE BENDS OF THE RIVERS

Zurich is the largest and most important town in Switzerland, and many splendid buildings have been erected there in recent years. It is the centre of the Swiss silk manufacture, and Zwingli, the Swiss reformer, lived there.

Berne, the Swiss capital, is a delightful town, with a university and a fine museum, and it contains the Swiss Parliament House. It is situated at a bend of the river Aar, and commands a fine view of the Alps.

Lucerne, the centre for Swiss tourists, is a curious mixture of ancient and modern, for while retaining its old walls and watch-towers, it is well equipped with modern improvements, such as electric lighting in the streets.

Interlaken, one of the most beautiful of all the beautiful spots in Switzerland, commands a good view of the famous Jungfrau peak, 13,669 feet high, the white mountain that can be seen in the middle of this picture.

The photographs on these pages are by the Photochrome Co., and Wehrli Aktien Gesellschaft, Zurich.

touching France, speaks French. Where the south border now runs down into Italy, the people speak Italian.

For long years the two races were at war with each other, then both were subdued by the Franks, who governed by their officers and counts. The great Charlemagne, whose dominions extended from Spain to Hungary, from Denmark to Rome, spent much time in Switzerland, chiefly, it is believed, at Zürich.

THE IRISHMAN WHO FOUNDED A SWISS ABBEY AND FORMED A GREAT LIBRARY

Many great monasteries and abbeys were founded or made more important in Charlemagne's days. One was that of St. Gall, founded by an Irish missionary, in which learning was carried on, and valuable books written and collected during the years of warfare and trouble that fell upon the country. At St. Gallen, now one of the chief industrial towns of Switzerland, many of these old manuscripts are still to be seen.

When Charlemagne's dominions were divided, the east and west divisions of what is now Switzerland fell apart again, and boundaries and rulers were constantly changing, and the people had a desperate struggle to keep any of the old rights, so dear to the hearts of all nations of German descent. Powerful churchmen and great families who had secured large grants of land, all managed to destroy the liberties of those who lived on the soil, just as in England, about the same time, the Normans were crushing the English.

When the German emperors took possession of the country they governed by nobles, who became more and more powerful and ambitious as the power of the Holy Roman Empire declined. It was the growth of free towns that helped the people to resist their lords.

THE FINE OLD TOWNS OF SWITZERLAND THAT TELL US OF THE PAST

These towns were walled, and they had charters which gave them freedom to trade and make money, like the free towns of Germany. Fribourg, meaning "free city," and Berne date from the twelfth century, and in their fine old buildings and handsome fountains we have many reminders of the far past. It was also in this century that the Crusades were preached in Switzerland with great fervour, and many brave men rose up and went, never to return.

In the next century comes the rise of the Hapsburg family, from amongst a crowd of nobles on Swiss soil, all trying by conquest, marriage, purchase of lands, or unjust takings, to get the lead. We have already seen the brilliant success of Rudolph of Hapsburg, who rose to be German Emperor. In Switzerland he waged war with Berne, forced lands from nobles and abbots, seized farms and estates, and his heavy hand was felt all over the country. Perhaps because it was so heavy the people resolved to bear it no longer. Anyway, the love of freedom seemed to revive, and their determination raised an enduring obstacle to Hapsburg ability and energy.

One of the tributaries that makes the Aar so large and full when it joins the Rhine is the Reuss. Leaping down the rough sides of the St. Gothard like the other rivers, it passes on through a long narrow lake with many branching armlets, and then out at the further end with rapid swing, past the beautiful old town of Lucerne.

THE FIERCE FIGHT FOR SWISS FREEDOM THAT TOOK PLACE ROUND A LAKE

It was round the shores of the Lake of Lucerne, sometimes called the Lake of the Four Cantons, because four cantons, or counties, share its shores, that the brilliant struggle for Swiss independence was carried on in the thirteenth and fourteenth centuries against the tyranny of the Hapsburgs.

Three out of the four cantons formed a league. They were Schwyz, which has given its name to the whole country, Unterwalden, and Uri. The men who lived in these three famous states, or cantons, were descendants of the freedom-loving Alemanni, and for them the lake was a common outlet and rallying place. Their towering mountains and valleys, hidden away from the rest of the world, had kept them distinct and self-reliant, and their bodies were hardy from the perpetual struggle to make their living under difficulties; their spirits were bold and fearless from constant contact with danger, which each had to meet for himself. Added to this was the intense love of country which makes brave men dare anything, just as a mother knows no fear when she has to protect her child. When once we see this glorious country, its towering

SWISS PEASANTS AT WORK AND PLAY

Living for centuries in their romantic valleys, amid grand and lofty mountains, the Swiss people, although made up of many races, have acquired a national character all their own. They have a buoyant love of liberty, and delight in a life as free as the air they breathe. Here we see a Swiss peasant family at play upon one of their grassy slopes.

Swiss women work as hard as the men. Here we see a mother carrying a churn of milk from the pasture. She is giving a flower that she has picked to her little child.

The Swiss peasants live in wooden houses built of logs that look as rugged as the mountains on which they stand. Here a peasant is storing fodder for the winter.

mountains, frowning, steep rocks, widespread forests, lovely green slopes, orchards and meadows, and the unspeakable beauty of the lake with its soft blue distances and deep shadows, it is easy to understand the patriotism of the three forest cantons.

HOW THREE MEN MET IN THE MOUNTAINS AT NIGHT TO SAVE THEIR COUNTRY

Many of the romantic stories that have been handed down through the centuries about these times are now considered untrue. But they are so firmly embedded in the country's story, and illustrate in such a graphic way the spirit of the times when the union, or confederation, of the states was taking place against a powerful enemy, that we still love them, even if the details are not true. Here is one of the stories.

On a green meadow, above the Uri branch of the lake, three patriots who had suffered greatly from Hapsburg rule met in the still, dark nights, and talked over their wrongs, and vowed to free their country from oppressors and to restore its ancient liberties. Friends joined them till the band became thirty-three. As these men raised their right hands to heaven, making covenant together, "One for all, and all for one," the sun shot its first cheering rays over the mountain-tops, and seemed to promise success. The three men of Ruetli have long been national heroes.

The romantic story of William Tell, who shot the apple from his son's head, is told on page 1674 of this book. All over Switzerland are statues and pictures to illustrate the act. One of the most beautiful poems of Schiller has spread the story or legend of William Tell all over the world.

A WHIRLWIND OF MEN THAT RUSHED DOWN UPON THE FRIGHTENED AUSTRIANS

In 1315 the spirit of resistance to the Hapsburgs led to the great battle of Morgarten, and this brilliant victory began a series of successes which for two centuries increased the feeling of union, as well as the military glory of the Swiss cantons. At Morgarten the large Austrian army was overwhelmed and destroyed in a narrow pass by the mountaineers, few in number. They lay in wait on the heights, and at the right moment hurled down on their foes stones, rocks, trunks of trees. Then the main body of the men of Schwyz and Uri rushed like a whirlwind down the hill on the terrified Austrians.

Some seventy years later the Austrians were again defeated. The battle of Sempach is famous for the brave deed of Arnold von Winkelried, about which we read on page 122.

Towards the middle of the fifteenth century there were eight cantons joined in union, and such was their power that they succeeded in getting the better, not only of the Austrian Hapsburgs, but of Charles the Bold, Duke of Burgundy, who harassed the west side of Switzerland nearest to France. At last the unity and bravery of the Swiss succeeded in making their independence of the emperor formally recognised, though in name they were attached to his dominions till the Peace of Westphalia, in 1648, which ended the Thirty Years War.

THE SWISS REFORMERS AND THEIR ENGLISH FRIENDS

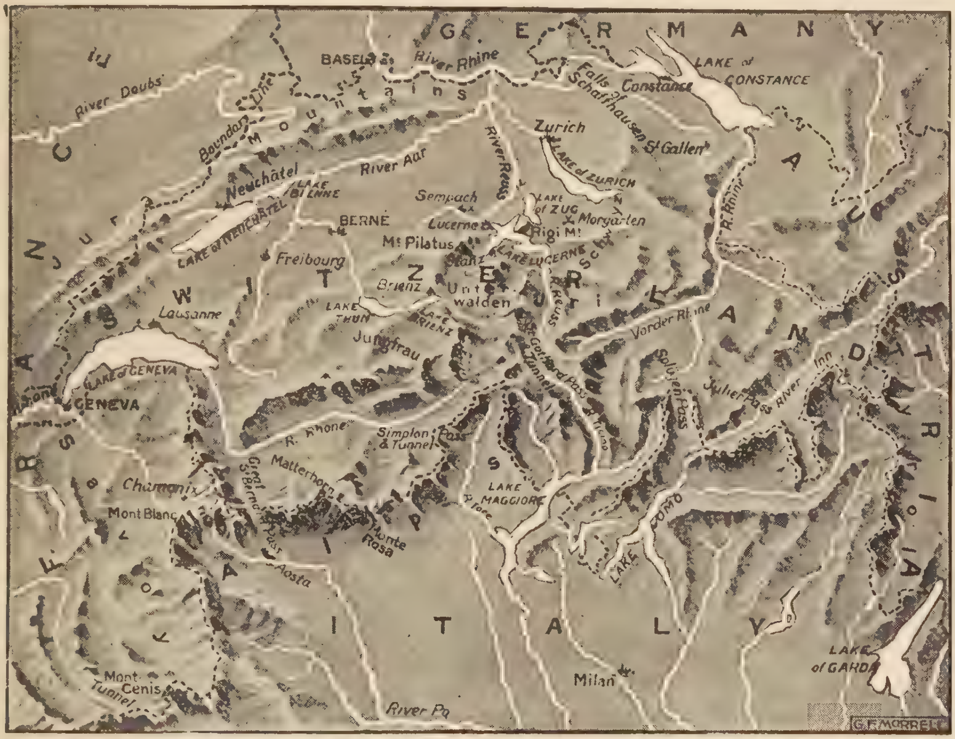
Switzerland had its own Reformation about the beginning of the sixteenth century. Large numbers of the people listened to the teaching of the reformer Zwingli and others, and left the Church of Rome. Unhappily, bitter feelings between the Roman Catholic and the Protestant cantons followed, and there were long civil wars before religious freedom was gained.

At Zürich are to be seen many letters from eminent persons of Reformation times, which show how much intercourse and friendship there was between the English and Swiss in those days. Especially interesting to us are those of Lady Jane Grey, when a studious girl of fourteen, to one of the Swiss divines. She translated part of one of his books into Greek, for a Christmas present to her father, and asks his advice how best to study Hebrew. At the last sad moment in the Tower, when at the block itself, the poor girl took off her gloves and asked that they should be sent to her Swiss friends. Letters from Queen Elizabeth, too, are amongst those at Zürich, encouraging the Swiss cantons and cities in their struggle for liberty.

Switzerland shared in the progress of those times when people began to care for study and art. The little country has reason to be proud of its writers and scholars, and the artists who have left such beautiful work behind for later times in the stained glass, wonderful carvings, and painted tiles still to be seen. Refugees from religious persecution in other countries did much to foster trade and industries, especially the weaving of linen and silk. But, despite all this prosperity, a time of decline set in, owing to various causes.

The deeds of daring and courage which led to the rise of the Swiss people spread their military fame over Europe, and Swiss soldiers were eagerly sought after, and hired for pay to fight in other armies, especially in France. This was bad for the independent nation.

Again, the influence of the despotic Louis XIV. spread over Switzerland as it did over Germany, and the spirit of absolute rule led to the peasants being ground down and deprived of their rights, while the governing classes indulged in luxury. There were many grievous risings, and the country was in a sad plight when the cry of the French Revolution, "Liberty, Equality, Brotherhood," spread, echoing over the plain of Switzerland. Hopes ran high for a nobler and happier lot, which were not realised for a while.



This picture-map of Switzerland shows us, at a glance, what the country is like. We see it as though looking down from a lofty airship. All over the country rise the great mountain peaks, and in between are the beautiful lakes and winding rivers. Other pictures of Switzerland are given on pages 2512 to 2515, 2162, 2876 and 2877.

When Napoleon turned the whole of Europe about as he chose, Switzerland could not escape. French armies—often fiercely resisted—passed through the cities, across the plain, over the snowy mountains at will. Napoleon made grand roads—that over the Simplon Pass is a wonder of the world—as Cæsar had done centuries before, and seized Swiss money and treasures. Then Napoleon turned the country into the Helvetian Republic, under his own eye. The Swiss naturally hated the pounding of the cantons into one state, and the old spirit of bravery and resistance flashed out again and again.

But it was not till after the Battle of Nations at Leipzig that the weight of Napoleon's hand was removed, and the Swiss were far from satisfied with the arrangements made at the Congress of Vienna. Many changes had to be lived through in the years of the nineteenth century before the twenty-two cantons as we see them to-day settled down to a federal union, perhaps the freest and most representative in the world.

HOW SWISS CHILDREN ARE TAUGHT TO BE CLEVER WORKERS AND GOOD CITIZENS

The Swiss believe that "education alone makes free," and their arrangements for teaching are such that they reach to the poorest child in the most remote valley, thus fitting all to take part in the universal voting by which the country is governed. Pestalozzi was one of the great leaders in improving education, and his influence has spread far beyond Switzerland. Great attention is given also to teaching trades of all kinds, and since the introduction of machinery Swiss industries have increased marvellously, in spite of want of coal and a sea-coast. The water power in the leaping torrents from the mountains is turned to use in saw-mills and other factories, and early last century in the cloisters of the famous St. Gall Monastery arose the hum of spinning, and in Zürich and the neighbourhood the cotton and embroidery manufactures now so famous all over the world began. The production of silk goods holds its own at Zürich and Basel, and at Neuchâtel and Geneva are made watches and musical boxes.

All round the borders of Switzerland, the trains now bring in the coal and raw materials needed by the industrious country, and carry away its finished work. Switzerland has also to obtain from abroad much grain, as well as coffee, rice, eggs, and other foods.

RAILWAYS THAT RUN UNDER THE MOUNTAINS AND ABOVE THE CLOUDS

The lines that pass on into Italy depend on the wonderful tunnels that have been made through the masses of the Alps. We read on page 2392 of the Mont Cenis Tunnel in the French Alps. The St. Gothard Tunnel is rather longer, and the Simplon Tunnel is twelve and a quarter miles long. The engineering of all these Alpine railways is most wonderful, not only in the matter of tunnels, where workmen starting from the two ends meet in the middle of the mountain, but also in the loop railways, and the numberless mountain lines that climb over passes, and up steep inclines to heights often above the clouds.

It is the tourists, the visitors "come out to play," who use these lines chiefly; by the railways they can reach places hitherto almost inaccessible, and enjoy the fine air and the magnificent walks and views, and can climb higher up if they have the strength.

It is delightful, too, to get a peep into the life of the mountain folk, to see them taking charge of the great herds of brown and cream cows, with their tinkling bells; making cheeses in the little huts; carrying down an immense weight of them to sell in the markets below. It is touching to notice how every little scrap of land is made the most of, and how the little bits of hay are collected in a net, and carried to the loft to be stored for winter use. For, as the cold and snow come on, the cattle are driven down from the heights when there is nothing for them to eat; and there is much lowing and jingling of bells as they make their way down.

HOW THE NATIONAL CROSS OF SWITZERLAND BECAME THE SYMBOL OF MERCY

A large trade in condensed milk is carried on in Switzerland, and the milk of Swiss cows is also used in chocolate-making. Swiss chocolate is particularly good. In the winter many of the mountaineers carve little animals, chiefly bears, like those to be seen in the pit at Berne, and little chalets such as they live in themselves, with stones on the roof, to keep it on in the stormy winds. They are also very clever in making flowers and other delicate things out of ivory. All these things and many made in factories, too, render the shops very tempting wherever tourists gather, especially in Berne, and Zürich, the largest town in Switzerland, Lucerne, and Geneva. It was in Geneva that a great meeting was held to try to arrange matters between the nations so as to lessen the horrors of war. It was then declared that nurses, and doctors, and ambulances must never be fired upon, and they all take as their badge of safety the cross which we see fluttering so gaily over all the public buildings of Switzerland as its national flag.

Since the Congress of Vienna, Switzerland has been a neutral or peace country. In war time she sides with no one, and only trains her sons to be ready to defend homes and dear ones if need be.

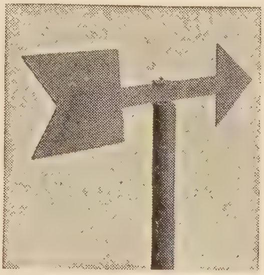
The next story of Countries is on 3011.

HOW TO STUDY THE WEATHER

CONTINUED FROM 2872

When we think of the changes in the weather day by day, it seems a most difficult thing to tell what it is going to be like to-morrow. Yet, in the newspaper every morning, we can read a forecast of what is going to happen during the day, and, although we cannot all have the wonderful instruments with which clever men foretell the weather, it is possible to construct a few devices with very little trouble.

In order to find out the kind of weather which is coming, it is necessary to discover whether the air around us is damp or dry. If there should be a great deal of moisture in the atmosphere, clouds, made of countless particles of moisture, are readily formed, and rain is likely to result. A piece of ordinary brown seaweed, hung up on the wall of a room, will tell us whether the air is damp or dry. When there is little moisture about, the weed will be crisp and hard, but directly rain is coming it will be damp and flabby.



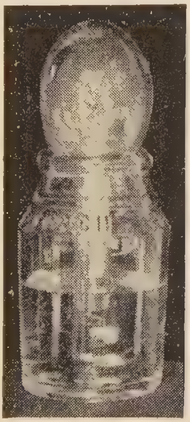
1. Weather-vane cut in wood

Another important matter is the weight of the atmosphere. Over every object in the world there is a great column of atmosphere, so to speak, miles in height. We get so used to the pressure that we do not notice it, but it is there all the same.

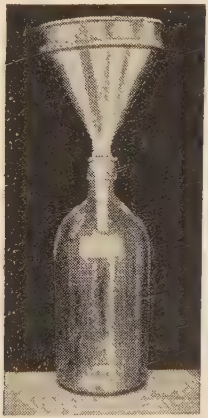
Now, the weight of air varies from time to time, because when the atmosphere is very moist it is lighter, while when dry it is heavier. On this account it is very necessary that we should know the changes in the pressure of the air. The barometer is an expensive instrument; but, with a glass jar and an oil-flask, we may make a device which will tell us a good deal about the weight of the air. Fill the jar about half full with water. Now place the empty oil-flask neck downwards into the water in the jar, as seen in picture 2. The water will rise up some distance in the flask. From day to day the height of the water will vary, and, indeed, it will be responding to the pressure of the atmosphere on the water in the jar, so that when the air is dry, and therefore heavier than usual, the water will be higher than when the atmosphere is moist and light. Thus we may expect fine weather when the water in the flask is high, and storms when it is low.

Animals are very sensitive to weather conditions. When it is likely to keep fine, leeches will remain quietly in the bottom of a jar, while at the approach of a storm they will become very restless. A frog in an aquarium keeps to the bottom of the water if the weather is going to be stormy, while in fine weather he will enjoy coming to the surface.

It is always interesting and useful to know which way the wind is blowing. In some parts of the United States, when the wind is in the west, it will not keep fine for very long, while an east wind, as a rule, means dry weather. It is quite easy to cut out a weather-vane, in the shape of an arrow, from a piece of flat wood, as seen in picture 1. If



2. Barometer made of a glass jar and an oil-flask



3. Rain-gauge made of a bottle and a funnel

you drive a nail exactly through the centre of the shaft, the vane may be fastened on to a broomstick, and the pole then fixed in an open place, such as the top of a summer-house, or from the upright branch of a tree. By watching the movements of the sun, or with a compass, we can soon find out which is the east, and the west, and so on.

It is easy, also, to keep a record of the rainfall. With a narrow-necked bottle, holding about a quart, and a funnel with an opening the same size as the bottom of the bottle, we can make a very simple rain-gauge. The end of the funnel is put into the neck of the bottle, and the whole thing left to stand in the open, perhaps on a lawn. The rain-gauge must be left out night and day, of course, and at the end of twenty-four hours you must look and see whether any rain has fallen or not — of course, emptying the bottle each time. The bottle used should be one with a flat bottom, and not one with a raised bottom inside. If, after a storm, there is an inch of rain in the bottle, that is the depth of rain that has fallen.

But it may not, perhaps, be easy for you to get a bottle and a funnel exactly the same width, and in that case it will be more difficult for you to measure the rainfall. It is clear that if we use a funnel 12 inches wide, catching the rain falling over a width of 12 inches of space, and then measure its depth in a bottle 6 inches wide, the depth in the bottle will be twice the real depth of the rainfall, because the width of water falling would be twice the width of space for it to fall into, and so the water would rise higher instead of spreading itself out. But if the top of the funnel is not the same width as the bottle, all we have to do is to compare the width of one with the width of the other, and do a little sum. We have to find out how one area compares with the other. There is a rule regarding areas which may look a little difficult, but which is quite easy. It is:

Area = square of diameter + 0·7854.

This means that to find the square inches within a circle we must multiply the diameter of the circle in inches by itself, and multiply the result by 0·7854. Now, suppose that the bottle is 3 inches in diameter inside. We multiply 3 by 3, giving us 9, and then we multiply 9 by 0·7854, and the result is 7·0686. The fraction is so small that for our purpose we may disregard it, and say that the area of the surface of the water in the bottle, or of the bottom of the bottle, is 7 inches. Now, let us suppose that the mouth of the funnel measures 6 inches across. We multiply 6 by 6, giving us 36, which we multiply by 0·7854, and get for answer 28·2744. This is just a very little more than 28 square inches, and we may count it as 28 square inches.

Now, if rain has fallen 1 inch deep in the bottle, we have to find what it would be in a bottle of the same diameter as the mouth of the funnel. To do this, we multiply 1 inch by 7, and divide it by 28. This gives us one quarter of an inch, so we say that a quarter of an inch of rain has fallen. Whatever the diameter of the bottle and of the mouth of the funnel may be, we can find the amount of rain by following these rules, and if we know the size of a garden or of a field, or even of a county, we can tell, by working it out, what *weight* of water has fallen over the whole area. The rule to work upon is that 27¾ cubic inches of water weigh one pound.

A CLEVER AND AMUSING WORD GAME

THE game of doublets is an interesting word game that gives plenty of scope for skill and ingenuity, and enables us to exercise our memories and to make good use of our knowledge of words. Two words are chosen, each containing the same number of letters, and the words should be either of quite opposite meaning, as wrong and right, black and white, good and evil, rise and fall, and so on, or they should stand for things quite different from one another, as wood and iron, butter and cheese, soap and grease.

The game is to change one word into the other by changing only one letter at a time, and making a chain of words between the doublets. Two or three examples will make the method clear.

black
slack
stack
stalk
stale
shale
whale
while
white

tame
time
tile
wile
wild
shoe
shot
soot
boot

beef
been
bean
beak
peak
perk
pork

cat
cot
dot
dog
more
lore
lose
loss
less

black
block
clock
click
chick
chink
chine
whine
white

It will be seen by these examples that only one letter is altered in each word to make the next, and every change makes an actual dictionary word. It is not allowable to make a change of a letter that will produce something that is not a real word. For instance, we might have changed beef into pork like this: beef, boef, boek, bork, pork. That, of course, would be wrong, as no such words as boef, boek, bork, exist.

Then the transformation from one word to the other must be made with as few changes as possible. In changing from black to white we might have proceeded like this: black, block, clock, click, chick, thick, think, thine, whine, white; but here we make eight words in between, and not more than seven are needed.

It must, of course, be understood that in changing one letter to make a new word in the chain, the substituted letter must occupy exactly the same position in the new word that the discarded letter did in the old word. Thus we can change bean into bran, but not into barn, for e being the second letter in bean, r must be the second letter in the new word, as it is in bran.

A LITTLE VEGETABLE GARDEN

WHAT TO SOW AT THE END OF MARCH

DELIGHTFUL as it is to have gay, sweet-smelling flowers in our garden, many of us are perhaps quite as much interested in growing vegetables.

March is one of the most important months of the year as regards vegetables. Think of it; all the vegetable seeds are waiting to be sown, and in many cases the early-sown seed produces the best crops, although there are certain tender subjects that must not be sown out of doors during this month; the scarlet runner beans, beet, limas, and dwarf French beans must wait for some time yet.

What shall we sow in March? Peas, tomatoes, Brussels sprouts, cabbages, cauliflowers, onions, lettuces, leeks, and radishes, some may with advantage be sown during the month, and if we like we may make two or three sowings of each by sowing part of the packet now and the remaining part a fortnight or three weeks later. This should certainly be done in the case of lettuces, radishes, and cress, or we shall have our whole crop ready to be eaten all at once.

Thin sowing is one of the most important things to remember, especially if we mean to grow strong, fine crops. It is easy to understand this; if a little plot of ground has food and nourishment enough to grow one hundred plants, it stands to reason that, if it has to divide this among three or four times that number, the little things will be partly starved.

It is a capital plan to mix a little dry sand or soil with the seed, and then to sow soil and seed together; this is especially to be recommended when we are dealing with *small* seed, for, of course, it would be quite unnecessary to mix sand or soil with peas or beans, or other large seeds. The exception to thin sowing is cress seed; that is always sown quite thickly.

A thing to be really proud of is to be able to grow a fine crop of onions; any child who does this has a right to be proud of the feat. They are by no means difficult to grow, and they are the most interesting of all garden crops. Let us consider them a few minutes. They are different from most of the vegetables we eat. They are bulbous plants, and, if we think of it, they make their bulb very quickly; much quicker do they come to full growth than most plants of this same nature. Then, too, there is something pretty and full of character in the appearance of those straight, tube-like green tops growing in a narrow bed, narrow to enable us to reach half over from one side, and the other half from the other, so that, when weeding or thinning out the little plants where they are growing too thickly, we do not tread more than can be helped on the actual bed.

Before the seed is sown, the ground should be deeply dug and manured if necessary. But onions like a firm bottom, so that the bed should be well *trodden* all over before the seed is sown, and the surface lightly raked over. Mix the seed with a little sand, for it is important to sow thinly, and make drills across the bed to receive it; these drills may be made with a thick stick, but the best thing is to fix three pegs in an old wooden rake, out of which the teeth have disappeared. The drills should be nine inches apart, and the seed may be covered with a quarter of an inch of soil; this may be done by raking back the little ridges that were thrown up when the drills were made. Finally, when the seed is in the ground and covered, the surface soil can be made firm with the back of a spade.

Onions like to grow in good, rich soil, and the manure should have been applied before this. They also like a warm, sunny position, not shaded by overhanging trees.

Sow the peas thinly; many people sow them in trenches four inches deep, as they withstand a dry time during summer better than on the level, and the rainfall, or water otherwise given, is of greater benefit, but the ground should be dug for a considerable width and the trench made afterwards.

Potatoes, carrots, parsnips and oyster-plants may also be planted at the end of the month, or earlier in the southern parts of the country. But the tomatoes, cabbages and cauliflowers are started in the house, in shallow boxes, and are carefully tended and transplanted until the weather is sufficiently warm. Six weeks later we may set out the little plants. Lettuces are best started in this way also, or in cold frames.

A GOOD GAME TO PLAY ON A TRAIN

HERE is an interesting game to play when we are travelling. While the train is standing in the station all the players look about, and take as much notice of things as possible. Then, when the train has left the station, and five minutes have elapsed, we take it in turns to name any object that we saw at the station. Of course at first this is very easy, and we can go round and round again, each player naming one object which no other player has mentioned. But as the game goes on, it becomes harder and harder to think. The one who is last able to mention an object wins the game.

THE NEXT VEGETABLE GARDEN IS ON PAGE 3175

HARE AND HOUNDS ON HORSEBACK

The hares waiting in readiness for the signal to start

The hares laying the trail of paper up a woodland path.

Some of the hounds, mounted ready for the chase, waiting while the hares have their ten minutes start.

Here the hares are laying a false trail through a gate.

A hound has jumped a ditch to follow the false trail.

A PAPER-CHASE on horseback is a common amusement for a holiday in England during the hunting season, and these pictures show us some of the most interesting incidents in a very successful run across country by boys and girls of from six to sixteen years of age.

All who possess a mount of any sort, from a hunter to a Shetland pony, or even a donkey, may be invited to join in the game, which is a very similar one to the paper-chase run on foot.

The two hares carry big satchels crammed with white paper, torn up into little pieces, and for a mounted paper-chase the trail must be laid as thickly as possible, in order that the hounds may be able to see and follow it at a good pace. The hares are given ten minutes start, to allow them time to lay a few false trails at places which they have carefully selected

A HOLIDAY SPORT FOR THE COUNTRY

Hounds following the trail across a shallow stream.

Following the trail in and out of a thicket of bushes.

Here we see some of the hounds jumping a fence, passing through a gate, and leaping a ditch in hot pursuit.

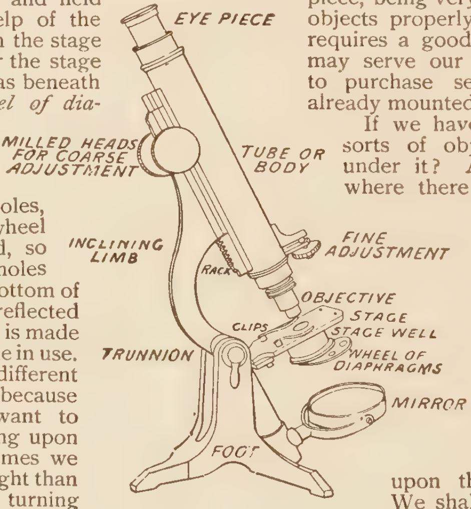
In these two pictures the hounds are puzzled because they have come upon places where false trails are laid.

beforehand. The course should be about six miles long, and should be free from dangerous ditches or jumps, although low jumps across narrow ditches or over obstacles which can be moved aside to allow the smaller children to pass through, if necessary, add greatly to the excitement and fun. The course should be as varied as possible, and if there are woods a good trail can be laid in and out of the trees for a little way; then a long straight run down a ride, along which the hounds can get a good gallop, whilst a shallow, pebbly bottomed stream to cross makes a specially good feature, and it is rather amusing to lay a part of the trail near the finish in a big sweeping half-circle, for even if the hares are spied by the hounds far ahead, or a few yards to one side, they must be followed by the trail, for no short cuts are allowed.

THE WAY TO USE A MICROSCOPE

On page 2319 of this book we read an account of the strange things that we may discover for ourselves by the use of a microscope, that wonderful instrument that opens for us so many obscure pages in Nature's book. We learn there what a microscope is, and we see in the pictures some of the things that a microscope can reveal. Here we shall see how to use the instrument.

In the middle of this page there is a diagram picture of a microscope, and by studying this picture we can see the purpose of the different parts of the microscope. The *tube* or *body* is the long, round portion that is really explained by its name. The *eye piece* is at the top end of the body, and at the other or lower end of the body is the *objective*, or the magnifying glass nearest to the object to be examined. The object is placed upon a *stage;* usually the object is mounted upon a small glass slide or between two small pieces of glass, which are then placed upon the stage and held in position by the help of the *spring clips* seen upon the stage in the picture. Under the stage is a *stage well*, which has beneath its lower end a *wheel of diaphragms*, or a *rotating diaphragm plate*, as it is also called. The diaphragm plate has in it a number of holes, and the entire plate or wheel can be turned round, so that any one of the holes desired may be at the bottom of the well, and the light reflected from the *mirror* below is made to shine through the hole in use. The reason why these different holes are provided, is because sometimes we may want to have more light shining upon an object, and sometimes we may want to have less light than at other times. By turning round the diaphragm wheel we can bring into use a hole that will let through just the quantity of light that we want.



Now let us turn to the frame of the microscope and see how the parts there are named, and learn their use. There is the part marked *foot*, which is really the base with three feet. This supports the body and every other part of the microscope. Next we have the *trunnion*, which is the place where the frame that carries the tube is fixed to the foot or base. The frame swings in the trunnion, and by loosening the screw at the trunnion we can swing the body of the microscope into a more inclined, or into a more erect position. Next we have the *inclining limb*, which rests in the foot at the trunnion, and which has two *milled screw-heads.* By turning these screw-heads we can lengthen and shorten the distance between the eye piece and the object, so as to bring the object we wish to examine into better *focus*, which means to bring it so that the eye can see it plainly, and not merely as a blurred outline. But these screw-heads which work the body up and down in the *rack* do not provide a fine enough adjustment to be quite right. Therefore there is, right in front of the body, a *fine adjustment screw*, which makes it possible to get exact adjustment so as to render the object under examination quite distinct, so that we can see clearly the hair on a fly's wing, or the little swimming things that live and fight in a drop of stagnant water.

Having seen the use of the different parts of a microscope, we may now learn something about the objects that we may desire to see magnified. Not many objects can be seen properly without some preparation and suitable mounting. The usual way to mount the objects is to put them between two small pieces of glass, cut to a suitable shape, the lower piece of glass being of ordinary thickness, and the upper piece, called the cover piece, being very thin. But to mount objects properly in microscope slides requires a good deal of skill, and it may serve our purpose much better to purchase second-hand specimens already mounted by experts.

If we have a microscope, what sorts of objects should we put under it? All around us everywhere there are countless things that will make us marvel as we see them with the sharper eyes that the microscope can lend us. We can go into the garden, or into the hedgerows, and collect some insects, including a spider. The insects can be killed with a drop of chloroform, and then put upon the microscope stage. We shall see great jaws, feet, claws, eyes that we never suspected to exist in anything so tiny. The spiders are really terrible. There is scarcely a tool or a weapon made by man that has not been anticipated in the structural form of Nature's tiniest creatures. We find many insects provided with what look like chisels, saws, scissors, and files. If we would see the beautiful colours that Nature gives to some of her creations, we must take the wings of some butterflies and let the light from the microscope mirror strike the glorious scales sideways; then we shall have a picture in colour that the most brilliant painter could not equal. Animate and inanimate Nature provide a wealth of material for our wonderment and instruction. Even the golden pollen dust that we rub off the flowers with our fingers is seen under the miscroscope to be of globular, elliptical, and other shapes, beautifully marked with dottings and ribbings. The pollen of each flower differs from that of all others, and each has its special interest.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 3067

WHAT THIS STORY TELLS US

THE grass that makes the countryside so beautiful, and provides the soft green carpet that we delight to walk upon, is so plentiful almost everywhere in the world that we think little about it and the many different forms that it takes. We see some of the more common wild grasses that grow in America in the part of this book that begins on page 1331, and in the following pages are some more pictures of familiar American grasses, which will help us to know these grasses by name when we see them growing in the fields or by the wayside. Grasses are very hardy, and in a fight for life between trees and grasses, when man takes no part, the grasses win the day, as shown by the vast treeless prairies in our land which were formed when the human inhabitants were few. In another part of this book we find pictures of most familiar American trees with their leaves and flowers.

SPLENDOUR IN THE GRASS

CONTINUED FROM 2732

WATER, it has been prettily said, is the eye of the world. Grass, let us add, is the soft mouth of Nature's face. It is only with water and with grass that the earth can smile, that the austere sadness of her countenance breaks up and gladdens with laughter. When the wind moves across the ocean or passes over the tall grasses, the face of the earth changes; she forgets her antiquity; she loses all count of the tragedies and desolations which have strewn her fields since the dawn of creation; she becomes like a babe in the cradle, sunning over with her smiles.

Homer sang of "the innumerable laughter of the sea," and David of the laughter of the cornfields. There we have the eye and the mouth of the world.

The grass of the earth has inspired men with gloomy ideas rather than joyous. We can think of five or six sad sayings concerning grass for every one that is happy. "In the morning it flourisheth and groweth up; in the evening it is cut down and withereth." "As for man, his days are as grass." "All flesh is grass," and so on. Even a poet like Wordsworth hints that only a child can receive the full joy of it:

> . . . Nothing can bring back the hour
> Of splendour in the grass, of glory in the flower.

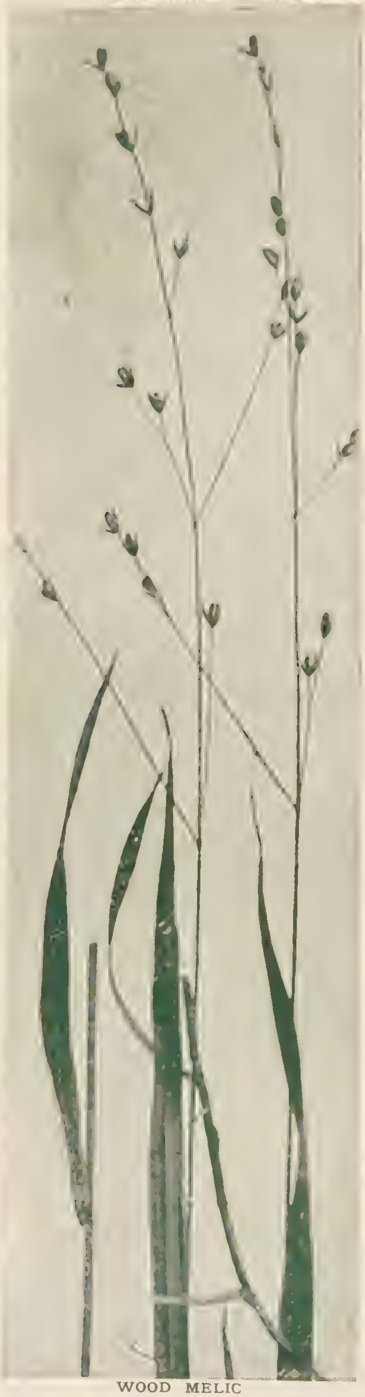
But joy is the note of grass. How a little patch of it, even when shaven and shorn, breaks up the grey sadness of cities! How good it is to get off the pavements and strike across the fields! How pleasant to escape from four walls and rest our eyes upon the little lawn in our garden!

And if these things be pleasant and good, what shall we say of the great summer pageant, when all the valleys stand high with waving grass, and the whole face of Nature flickers and dimples and overflows with the ripple of its joy? Then it is that we feel the undying childhood of this old world, then it is we realise the eternal infancy of Nature.

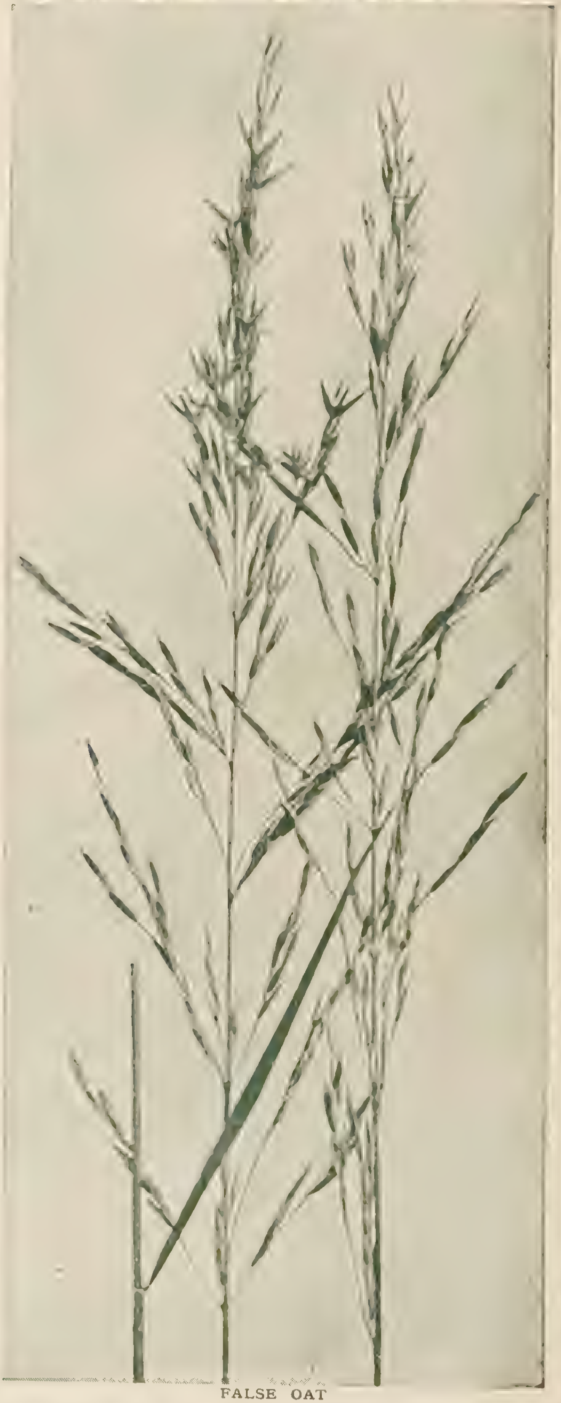
Take into your hand as much as it will hold of bird-seed. Look at those minute specks—white, brown, grey, and black, some quite round, others three-sided, and some no shape at all. Feel how they run like sand through your fingers. How light they are, these myriad grains! There are millions and millions and millions of these tiny seeds, which feed the birds of the earth.

The fields of the earth, standing thick with grasses, are full of these joyous grains. The wind blows, the grass waves, the little seeds stick to their nests. But the gleaner comes, and the seeds are shaken out like a waterfall—the fields empty themselves into the granaries of men. But there are millions of acres where no man comes, and where the grasses are filled with seeds, more in number than the stars; they are even as the sand on the seashore; and from the earliest days of the earth they have come down to us with the message of the waving grass that "God's in His heaven, all's right with the world."

SOME MORE FAMILIAR GRASSES



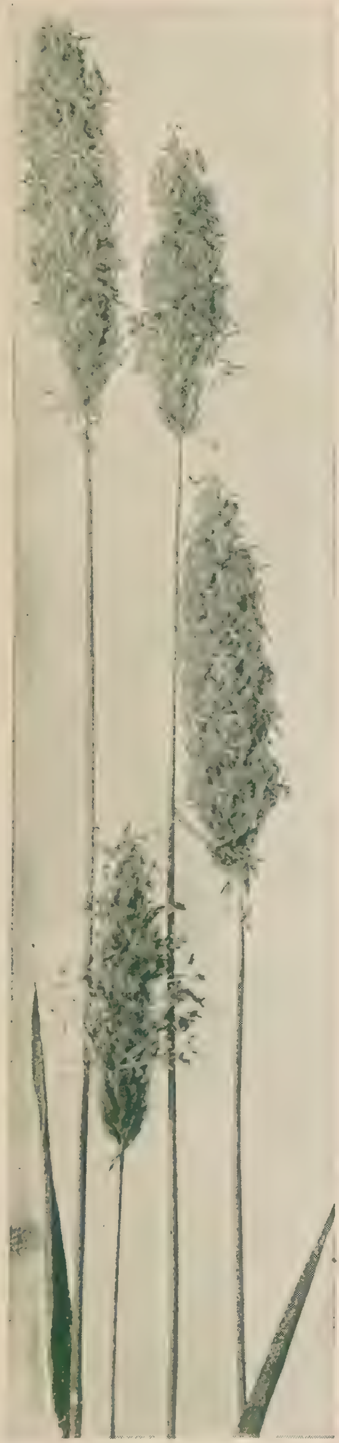
WOOD MELIC
GROWING IN SHADY PLACES, MAY & JUNE



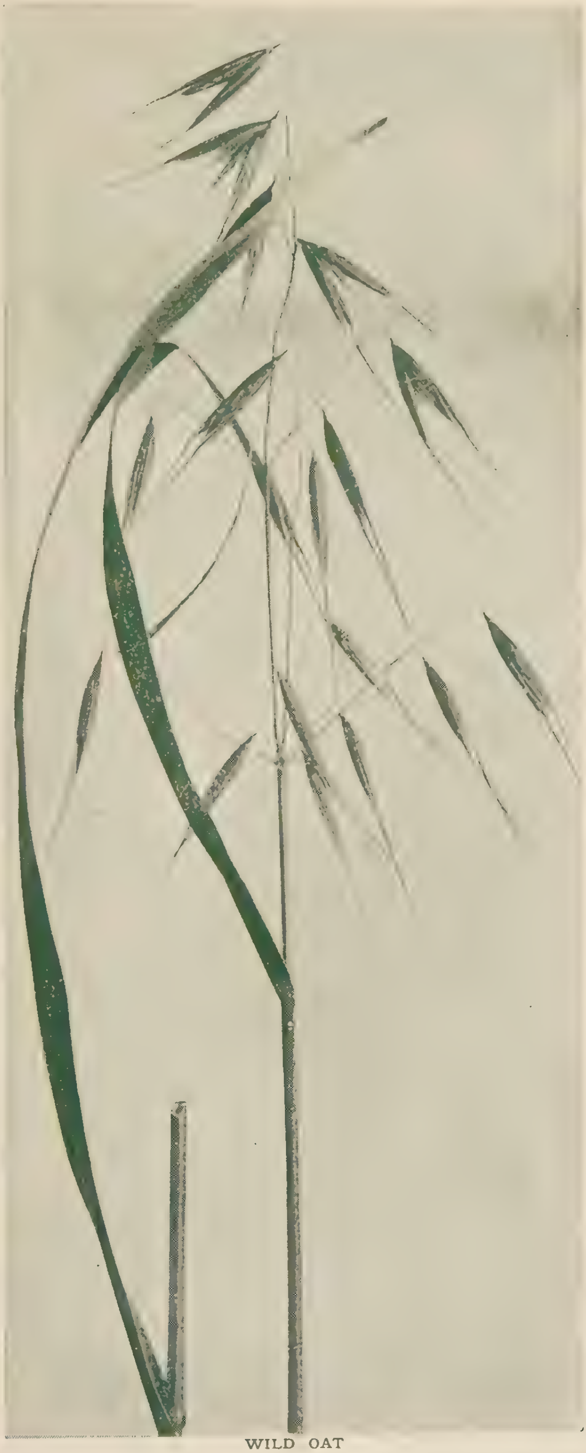
FALSE OAT
GROWING ON ROADSIDES, FROM JUNE ONWARDS

Wood melic has fewer flowers borne on its stems than any other grass. We can see this if we compare its picture with those of the other grasses. As in the case of false brome, shown on page [illegible], the false oat gets its name from the doubt which has arisen as to whether it is an oat grass or not. It is generally, however, considered to be one.

The photographs on these pages are by Henry Irving.

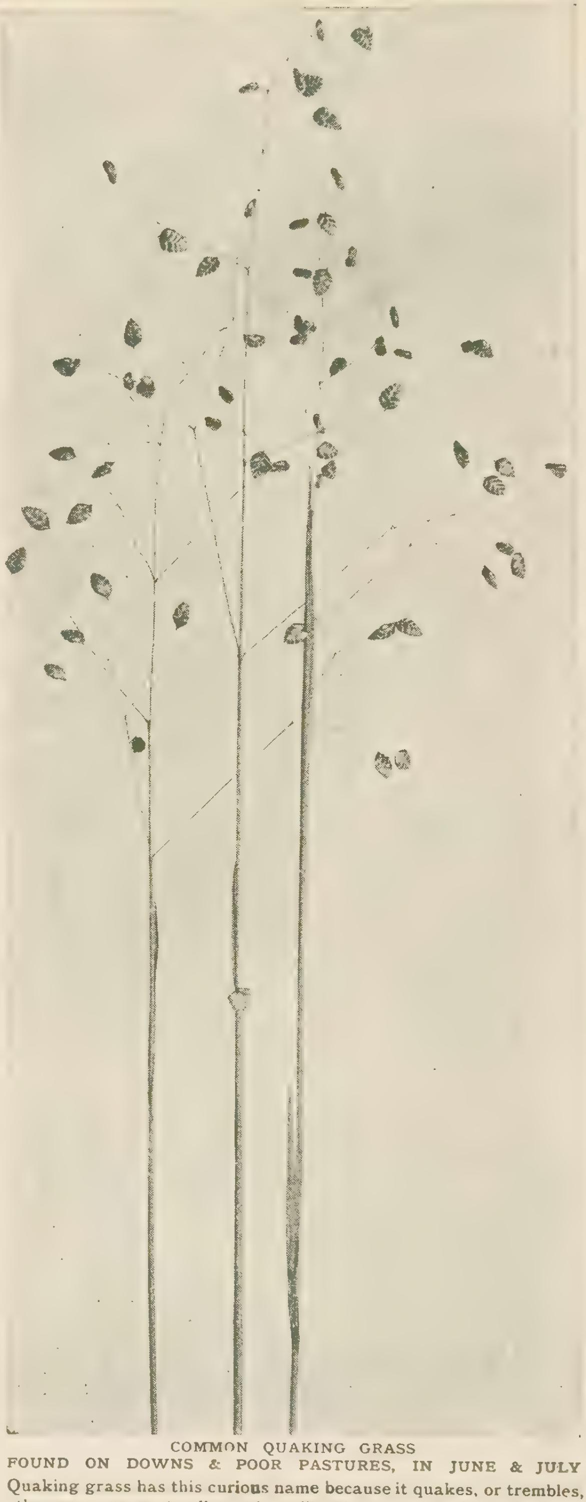


MEADOW FOXTAIL
GROWING IN MEADOWS, FROM MAY

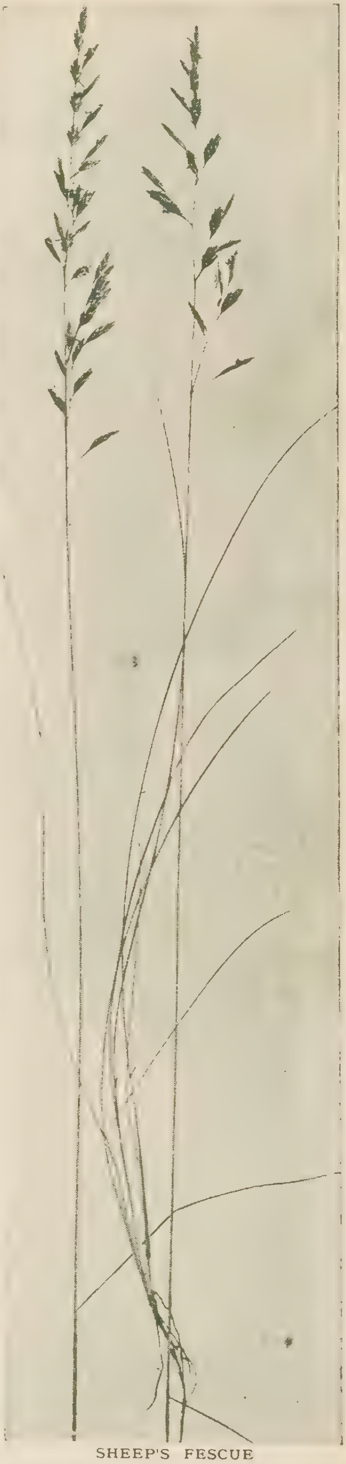


WILD OAT
GROWING IN CULTIVATED FIELDS, IN JULY AND AUGUST

In some parts of the old country, foxtail used to be called "guinea grass," because English children, and sometimes grown-ups, too, used to collect the heads and sell them for a guinea a bushel. From the wild oats have sprung the improved or cultivated sorts with which oatmeal and other articles of food are now manufactured.

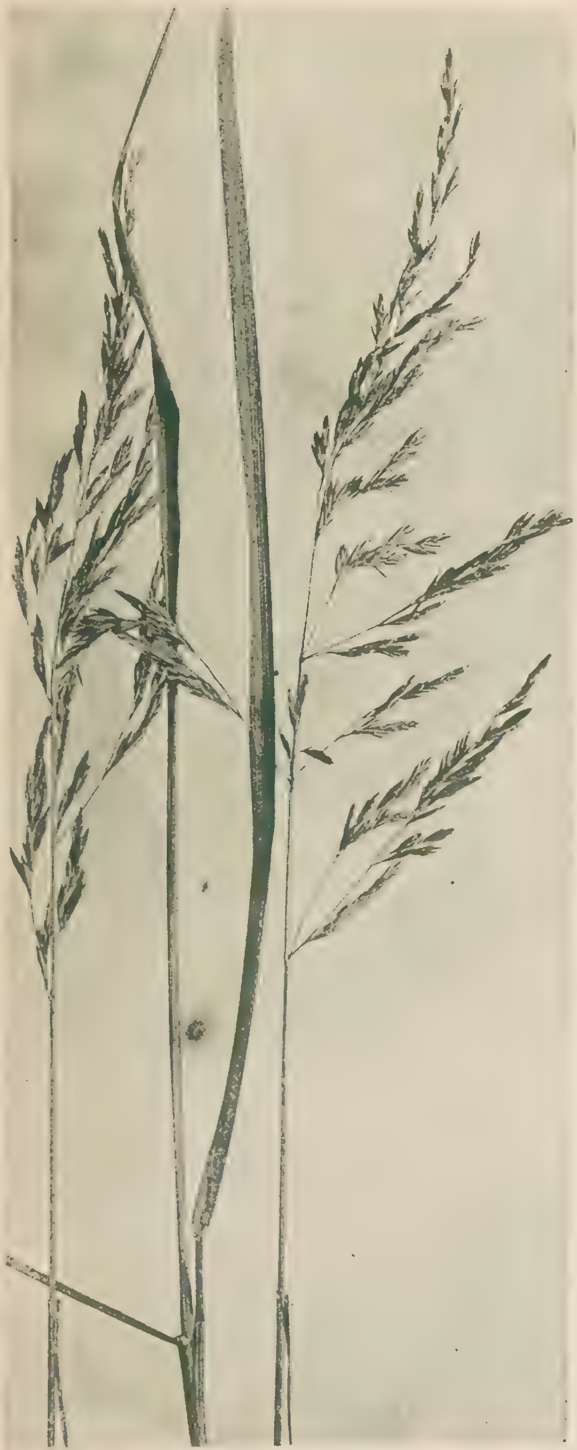


COMMON QUAKING GRASS
FOUND ON DOWNS & POOR PASTURES, IN JUNE & JULY

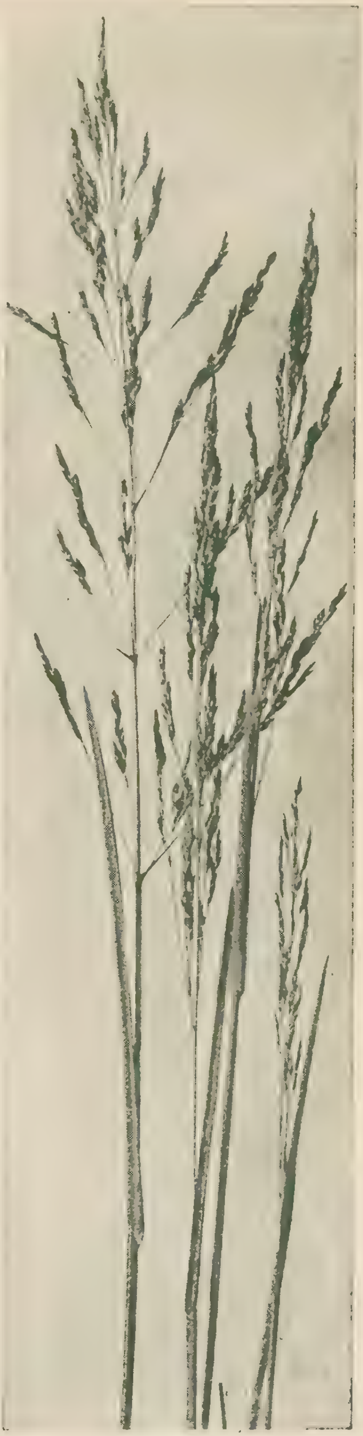


SHEEP'S FESCUE
FOUND ON DOWNS & MOORS, IN JUNE

Quaking grass has this curious name because it quakes, or trembles, in the slightest breath of air, when all the other grasses are standing quite still. As we may judge by its name, sheep's fescue is a favourite with sheep. It grows in rough places which would otherwise be barren and afford no food for flocks. Fescue means "stalk."

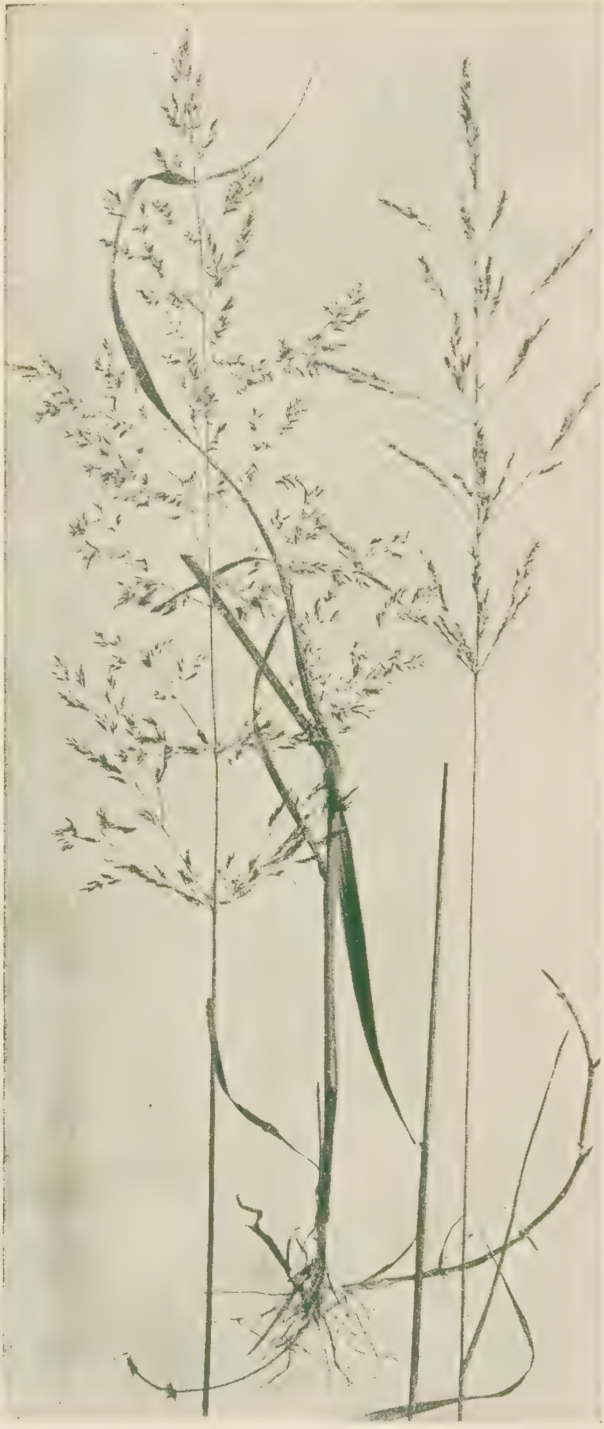


TALL FESCUE
GROWING IN MOIST MEADOWS, IN JULY & AUGUST

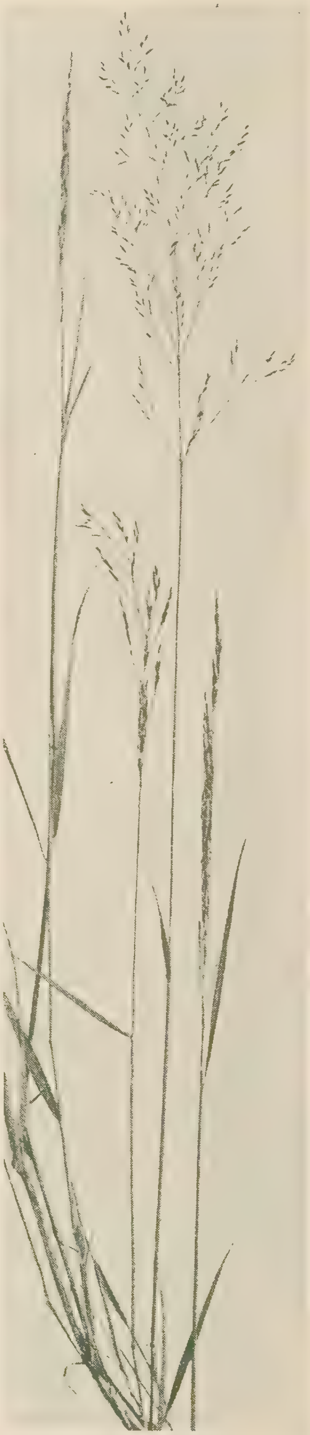


SMOOTH MEADOW GRASS
GROWING IN MEADOWS, JUNE & JULY

Tall fescue grass does not make very good food for cattle, but it is useful in another way, for it grows so tall that it can be cut down and used as a litter, or bed, for animals. Smooth meadow grass is one of the lime-loving grasses. Hence it is to be found often in company with crested dogstail, shown on page 1335.

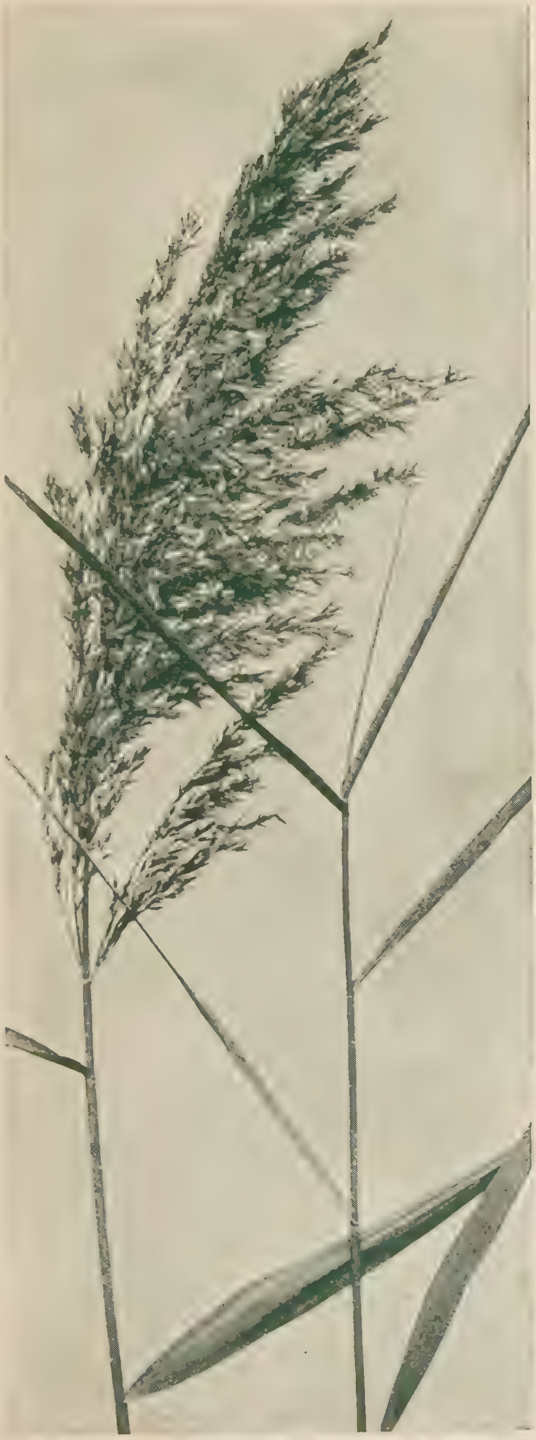


MARSH BENT GRASS
GROWING IN DAMP PLACES, FROM JULY ONWARDS

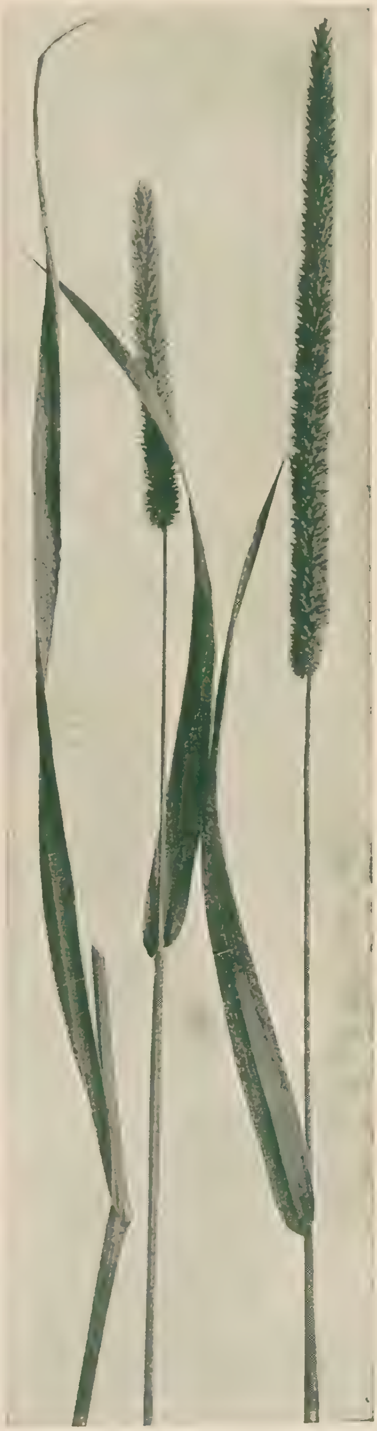


BROWN BENT GRASS
FOUND ON PEAT MOORS, JULY

Bent grass is a very hardy grass — that is to say, it is difficult to kill. For this reason we find that the grass which grows by the roadside, or where there is much traffic, is largely bent grass. It is also a useful grass to plant on sandy hill slopes where otherwise water is likely to wash the earth away



COMMON REED
GROWING BY PONDS AND MARSHES, IN SEPTEMBER



COMMON CATSTAIL
GROWING IN MEADOWS, JULY & AUGUST

It is easy to tell reed grass from others, because it is much later in flowering than the other waterside loving grasses. When we look at common catstail, we can see that there is no other grass quite like this, and that it quite deserves the name of catstail. You can hardly fail to notice it as you pass through the fields.

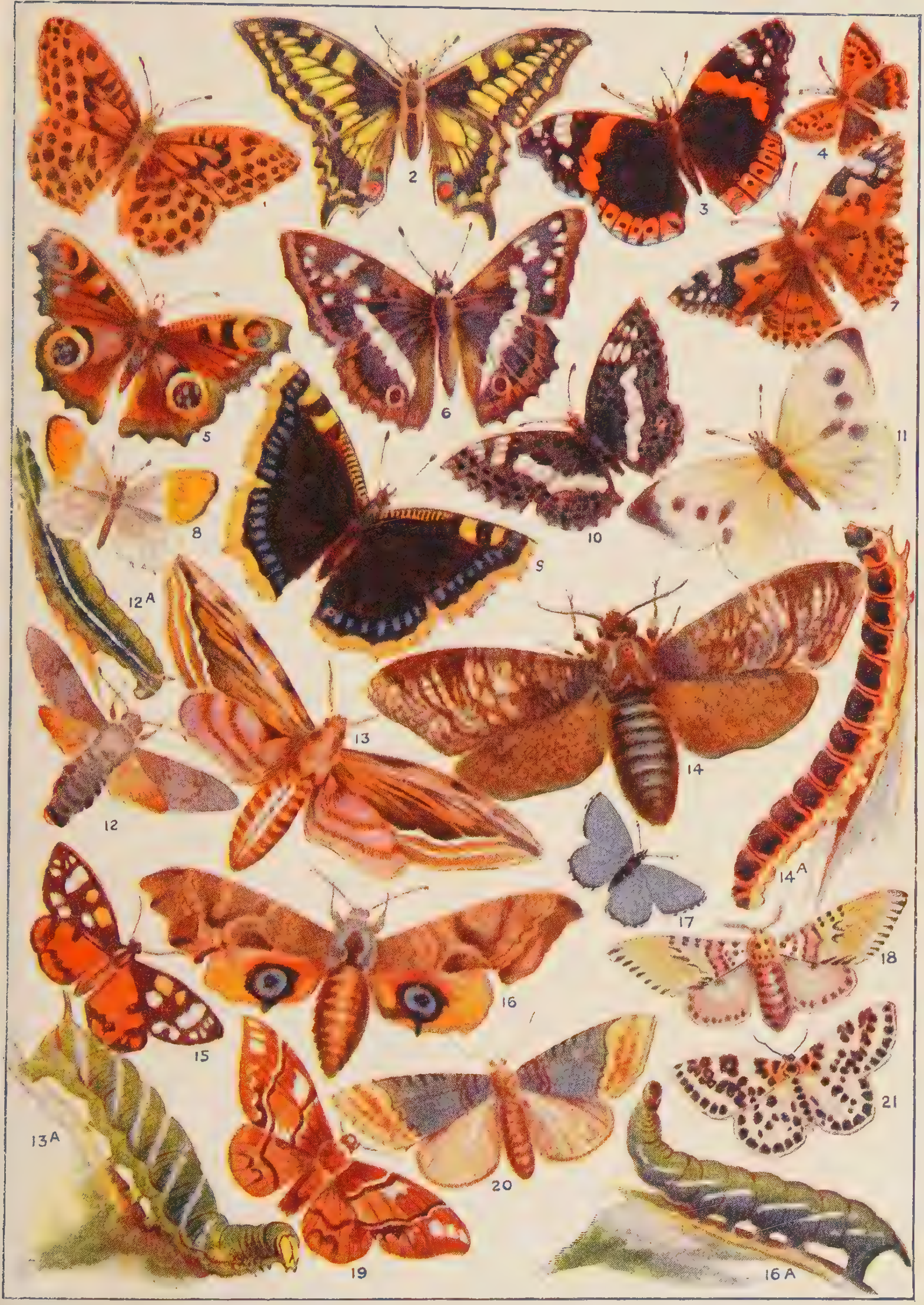
MAT GRASS
GROWING ON WET MOORS, IN JUNE

TUFTED HAIR GRASS
GROWING IN DITCHES AND WET PLACES, IN JULY

Mat grass, sometimes called marram, meaning "sea-straw," is found on sandy "dunes" or "denes" by the seashore. In Northern Africa, where it grows taller and thicker than elsewhere, it is cut and used for the manufacture of paper. Tufted hair grass is generally to be found in the company of floating foxtail, shown on page 1334.

THE NEXT PICTURES OF FAMILIAR THINGS BEGIN ON PAGE 3097

SOME WELL-KNOWN BUTTERFLIES AND MOTHS



Butterflies and moths are among the most beautiful creatures in all Nature, and as they flit in the brilliant sunshine their gay wings glint and flash in the light, and add wonderfully to the glories of the country. Here we see some British butterflies and moths, with a few of their caterpillars.

1. Silver-washed fritillary
2. Swallow-tail butterfly
3. Red admiral butterfly
4. Small copper butterfly
5. Peacock butterfly
6. Purple emperor butterfly
7. Painted lady butterfly
8. Orange-tip butterfly
9. Camberwell beauty
10. White admiral butterfly
11. Large white butterfly
12, 12a. Humming-bird hawk moth
13, 13a. Privet hawk moth
14, 14a. Goat moth
15. Scarlet tiger moth
16, 16a. Eyed hawk moth
17. Clifden blue butterfly
18. Puss moth
19. Kentish glory moth
20. Buff-tip 21. Magpie moth

Butterflies and moths both belong to that order of creatures which scientists call lepidoptera, a long word that means simply "scaly-winged," and the name is given because their wings are covered with scales, or tiny feathers, that appear to the naked eye like fine dust. Butterflies and moths differ very little from each other. The butterflies fly mostly by day and the moths by night, but there are exceptions in both cases.

BUTTERFLIES AND MOTHS

CONTINUED FROM 2950

EVERY boy and girl can have a year of fascinating study as the result of a short ramble in the garden. We can trace the butterfly or moth from the time it leaves the egg, through all its changes, until from its egg another butterfly or moth is born. With some, the life-history does not take a year to run its course, but if we get a moth or butterfly whose chrysalis lives from the end of autumn until the beginning of summer, we shall have provided against the dull winter months. When we have watched the course of life through which these insects pass, we shall have been witnesses of one of the most wonderful series of events in Nature.

The life of the bee and the life of the ant make the wisest men wonder. But the deeper we go into the mysteries of Nature, the more we learn—the more we realise how ignorant we really are. We know all that happens in the life of the caterpillar, from the egg to the fully developed butterfly, but we do not know why it happens as it does.

Here we have a similar course to that run by the bee and the ant. First there is the egg; next there is the caterpillar, or larva; after that the chrysalis, or pupa; and finally the perfect insect with wings, which is called the imago. The larvæ of the bees and ants are protected until the perfect insect appears. The bee is in its cell; the ant is underground, watched by full-grown ants, who are tender nurses as well as bold defenders. But the case of the caterpillar is different. Born from a tiny egg, it is so small that, in some cases, we cannot tell for a day or two whether the eggs have actually hatched. We have to use a magnifying glass, and breathe on the mass of tiny life, if the day be cool, to stir it into activity, and so make sure that the little caterpillars are born.

There could not be a more helpless thing than the caterpillar is at this stage. If we kept some caterpillars in a case, and a few ants got into the case, they would soon eat up all the young larvæ. By the way, they will do the same with big caterpillars, too, if we are not careful to have a box or case with holes too small to give the ants admittance. A small boy who left three lovely caterpillars safe and sound feeding on leaves in a big match-box overnight, sat down and wept in the morning when he found what had happened. The ants had made their way into the box, and had eaten two of the caterpillars, and the moment the little owner opened the box they began to pull the remains of the third caterpillar out after them, to carry it off to their nest. That serves to remind us how defenceless the poor caterpillar is. Yet in this weak and helpless state the caterpillar must live its life, or we could have no butterflies to brighten the gardens and the woods; no gorgeous moths to make the country lovely. Might it not seem as if Nature had for once made a mistake in exposing one of her families to the perils which the caterpillars run, with so many enemies—birds, animals, and insects—ready to pounce upon them and gobble them up? That is the puzzle which wise men have studied.

Nobody can say positively that he knows exactly why the life of the butterfly should run just as it does, but we are able to work out a theory by which it may be explained. Creatures which are born from large eggs are provided with so large a mass of food in the egg that when they emerge they are well developed, and able soon to look after themselves. Birds which are born from tiny eggs are always helpless. Take the strong, healthy young chicken from the big hen's egg, and contrast it with the puny baby pigeon, so helpless and feeble.

CATERPILLARS THAT FEED HEARTILY & SOME BUTTERFLIES THAT EAT NOTHING

Well, the creature which comes from the small egg must grow big and strong. But as soon as it reaches maturity, and becomes a perfect insect with wings, it wants to lay its eggs. There are many eggs to be laid, and it must have greater strength to supply them than the food of any butterfly could yield if, at the same time, it has to go on growing. Therefore Nature has provided a middle course—the caterpillar stage.

The caterpillar can eat an extraordinary amount of food, whether it be leaves, or the bark of trees, or, in the case of the larvæ of the clothes moth, wool and fur. Butterflies and moths cannot "eat" things; they only sip honey and other liquids. The bodily strength must be acquired by the caterpillar, for some of the perfect insects have so poor a mouth that they cannot take *any* nourishment; their whole life on the wing lasts only about three days, and in that time neither bite nor sup, as people say, is taken by them.

The caterpillar is the great feeder, and that is the fact which winds up our theory. If the strength of the butterfly or moth is to be built up upon what the caterpillar eats, the caterpillar must eat heartily. The butterfly and moth lay a great many eggs. Now, if all these ran their full course, if they all became caterpillars, and in the end turned into other butterflies and moths, then very soon the world would be deprived of nearly every green thing; the caterpillars would eat all the vegetation off the face of the earth.

THE MAGIC STORY OF THE INSECTS WITH THE BEAUTIFUL SCALY WINGS

So Nature, while giving the moth and the butterfly power to undergo these marvellous changes, plans that there shall be a period of comparative helplessness in the caterpillar's history lest all plant life should be killed. With these thoughts in our minds, let us now take a nearer view of the magic story of these beautiful insects' lives.

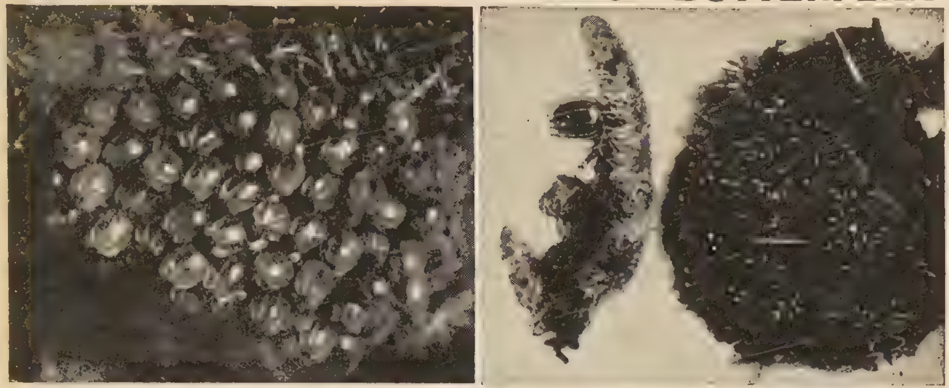
It is not easy to divide the moths clearly from the butterflies. Together they form what are called the lepidoptera order—that is, the order of insects having scaly wings. Instead of being covered with hair, these creatures have their wings covered with the tiniest powdery scales. These scales are of various forms and sizes, and are fixed at various angles to the wings, whose delicate membranes they serve to cover and protect. It is these little powdery scales which, breaking up the rays of light, give the butterflies and moths their lovely shades of colour. Both butterflies and moths are clad in this way, so the distinction does not lie there.

We think of moths as creatures which come out only at night or in the twilight, like the bats and owls. But there are moths that fly by day, and not at night. Night-flying moths are very rare in parts of America, owing to the great number of bats and insect-hunting birds which are on the prowl when darkness sets in and would seize them.

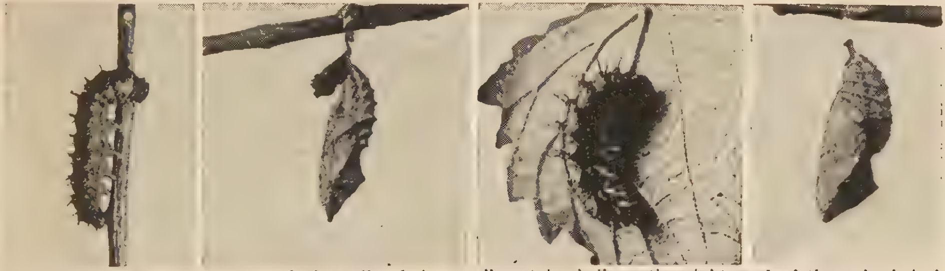
THE WONDERFUL ARRANGEMENT OF HOOK & EYE THAT FASTENS THE MOTH'S WINGS

Most varieties of moths do fly by night, of course, but these exceptions show that we cannot make the matter of their hours of activity the point upon which to decide whether an insect is a moth or a butterfly. We have to leave it to the naturalist to decide. He is able to show us that the two pairs of wings in the moth are fastened together by a beautiful little arrangement of hook and eye; the hook on the inner margin of one wing

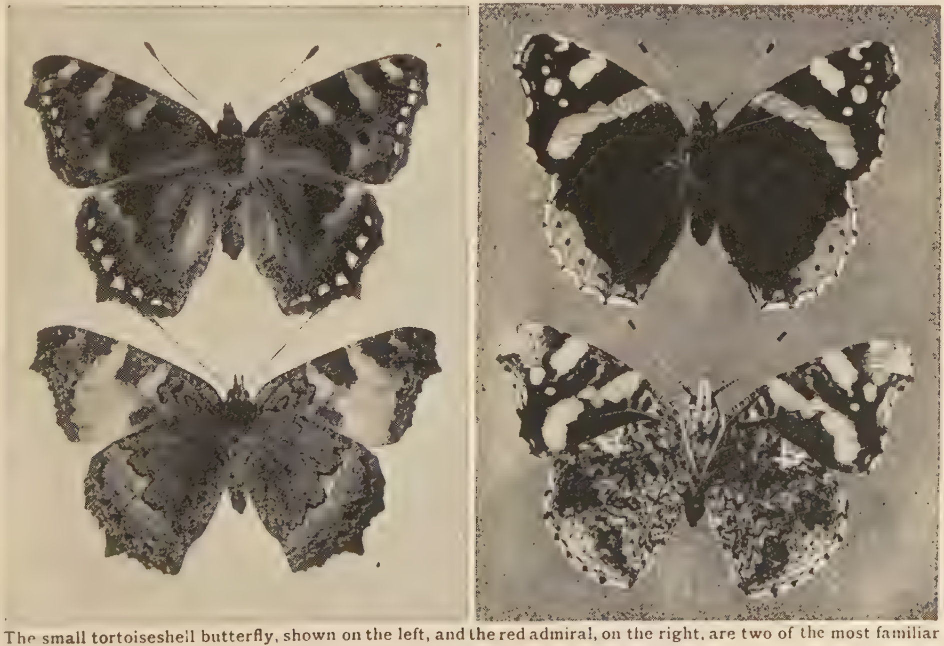
THE LIFE-STORIES OF TWO BUTTERFLIES



In the picture on the left we see the eggs of the small tortoiseshell butterfly, magnified 100 times. They are laid on the underside of a nettle-leaf, and are exactly the colour of the leaf. On the right is the red admiral butterfly's egg, seen first from the side and then from the top. It can be distinguished by the white rib-like markings.



Here we see the caterpillar and chrysalis of the small tortoiseshell on the right, and of the red admiral on the left. The tortoiseshell's caterpillars are found in colonies on nettles, but as they grow bigger they separate to search for food, and soon change into the handsome gilt-spangled chrysalis. The red admiral caterpillar, on the other hand, prefers a solitary life, and it protects itself from the weather by drawing leaves round it with a silken thread. Its chrysalis, like that of nearly all the butterflies, hangs by a single thread.



The small tortoiseshell butterfly, shown on the left, and the red admiral, on the right, are two of the most familiar British butterflies, and the latter is also one of the most beautiful. In these pictures, as in those on the following pages, the top specimen shows the beautiful upper side of the creature, and the lower picture the dull underside.

The photographs on these pages are by A. E. Tonge and J. J. Ward.

locking into the eye of the upper wing. The butterflies lack this provision. Then there is a difference in the character of the antennæ, which, as we know, is the word meaning the feelers of the insect. The butterfly's antennæ are club-shaped at the tips; those of the moth are plain, though often "feathered." It is in these two directions that the difference lies.

THE BUTTERFLIES THAT FEED BY DAY AND THE MOTHS THAT FEED BY NIGHT

The habits of both sections are very similar. The butterflies generally live by feeding on the nectar of flowers by day; the moths, for the most part, take the same sort of food by night. Both lay their eggs on plants or on other material which will provide food for the caterpillar when it leaves the egg. The chief distinctions between the caterpillars are two. The first is this: that the caterpillar of the moth, when it changes its form, generally spins for itself a cocoon of silk, or makes some other form of dwelling in which to undergo its alteration; whereas the caterpillar of the butterfly is, as a rule, content to suspend itself by one silken thread, or at most a band of silk woven about its middle. The second distinction is that the chrysalis of the butterfly is commonly of a golden colour; the chrysalis of the moth, called a pupa, is generally a deep reddish brown.

The perils of the caterpillar begin before the caterpillar is born. The parent lays the eggs in a position where, in spite of all her care, they may be eaten by beetles or small birds. Luckily for the family, the eggs are not all laid in the same place. The butterfly or moth chooses a place which will suffice to feed the young caterpillars when they are hatched; and lays an instalment of eggs. Then she goes to a similar place and deposits a second instalment.

THE LITTLE CATERPILLAR THAT BURSTS ITS SHELL AND AT ONCE GROWS HUNGRY

The eggs may be of various sizes, shapes, and colours, but the process which they undergo is always the same. If the weather be warm they will be hatched in eight or ten days, and a weak little caterpillar bursts its shell and at once grows hungry. The first thing it does is to gnaw the leaf upon which it finds itself, or to eat the shell of the egg from which it came. It soon begins to increase in size. It eats as if nothing could tire it. Its powerful jaws enable it to eat and gnaw the leaves upon which it finds itself, and so good does this food prove that, in a few days, the caterpillar finds itself in much the same position as the growing crab—it has become too big for its skin.

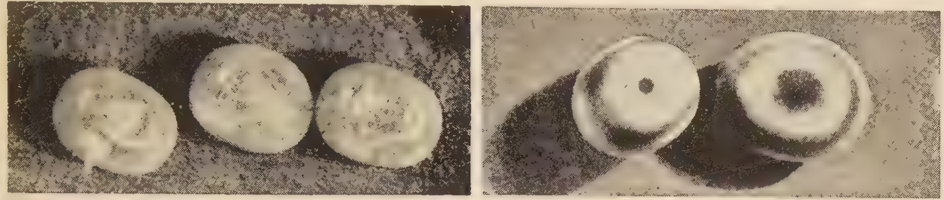
Therefore it has to undergo a moult. This is a long and difficult process, for the old skin has to be rent at the back of the head, and the caterpillar has to draw its entire body—legs, feelers and all, through the rent. Nor is that the worst of it. Like some of the shell-fish, the poor caterpillar must cast aside the lining of the canal down which its food passes—it is a complete moult of the skin of the caterpillar, inside and out. After the task is finished the caterpillar is quite exhausted, and it has to take a good rest to recover. While it is resting, its jaws, which have been soft since they lost their covering, become hard again, and soon the spirits of the caterpillar revive, and it goes on feeding and feeding, until it becomes necessary to undergo another moult.

HOW THE CATERPILLAR'S LIFE IS MADE UP OF FEEDING AND CASTING ITS SKIN

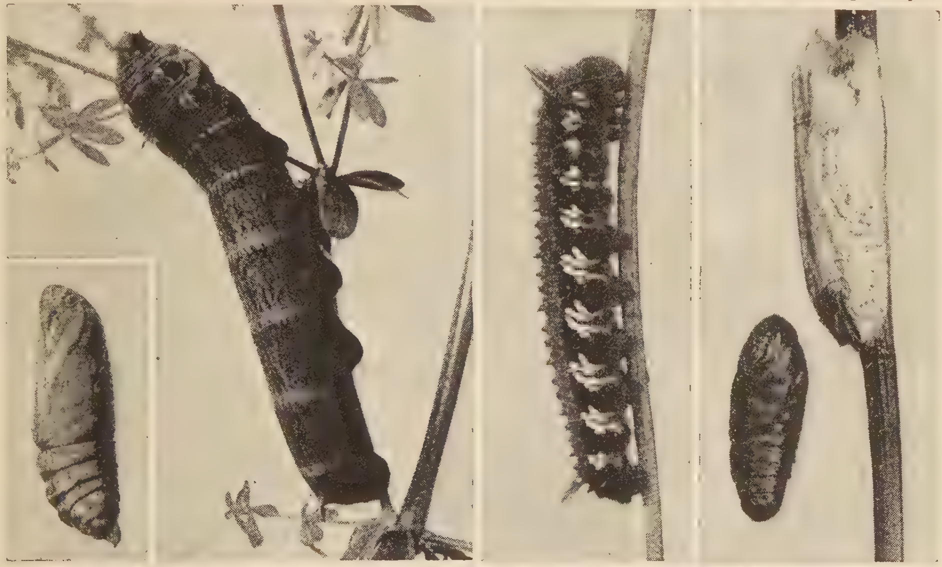
The form of this second moult is the same as the first. The caterpillar's life is made up of feeding and casting its skin. No sooner has it become vigorous and hearty than it must jump out of its skin again. This may happen from five to ten times. It all depends how long the caterpillar is to remain a caterpillar. Some change into chrysalises at the end of a month, while others, like the caterpillar of the goat moth, remain in the larva stage for three years. The caterpillar of the privet hawk moth is one of the caterpillars in a hurry. It is that very beautiful light green caterpillar which has pretty stripes along both sides, and a little curved spike over the tail.

This becomes a very big caterpillar, but it does all its growing in a month. Six times in the course of its first twenty-two days of life it changes its skin. After the sixth moult it seems to know that there will be no more trouble of this sort, and it feeds itself up as if it were going in for a show. Ten days after the sixth moult it reaches its fullest size, and it is then ready to become a pupa, or chrysalis.

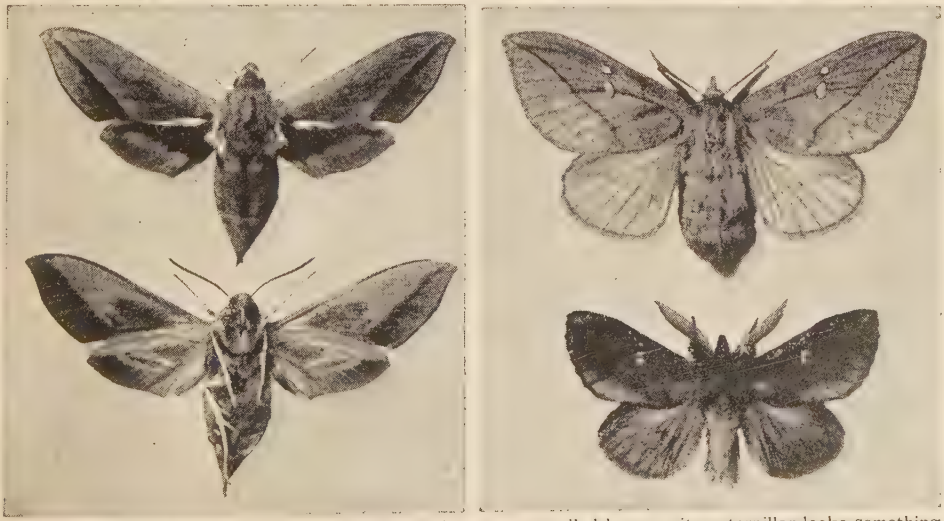
THE ELEPHANT HAWK & THE DRINKER MOTH



We have many hawk moths in this country, and they get their name from their powerful flight, supposed to resemble that of the hawk. On the left we see the green eggs of the elephant hawk moth, magnified 100 times. On the right are the eggs, also enlarged 100 times, of the drinker moth ; they are white and have a central green spot.



The caterpillar of the elephant hawk moth is green at first, but when about half grown it changes to a purplish brown. The chrysalis, enclosed in a loose cocoon, passes the winter on the ground among the roots of its food-plant, willow-herb. In the left-hand picture we see both stages of the elephant hawk, and on the right the caterpillar and chrysalis of the drinker moth. This latter hides among the rubbish in hedge-bottoms, and is fond of drinking dewdrops. It feeds on grass, and is easy to find on a dewy morning or after a light shower.



The elephant hawk moth, shown in the left-hand picture, is so called because its caterpillar looks something like an elephant's trunk. It is one of the smallest of the hawk moths. On the right we see the drinker moth, which gets its name from its large proboscis, or trunk, with which it drinks. The female is larger than the male.

By this time it has eaten so much that its weight is 11,312 times as much as the weight of the same caterpillar when it was born. Then there is the goat moth; what has he done in his three years of caterpillar life? He has made himself 72,000 times as heavy as when he left the egg. The case of the privet hawk moth has been mentioned only because he is one of our popular garden beauties, not because his appetite is exceptional.

One caterpillar, which lives on the oak-tree, was watched for fifty-two days, and in that time he was found to eat 120 oak leaves, weighing three-quarters of a pound, and to drink half an ounce of water. The food which this hungry caterpillar had eaten in that time was equal to 86,000 times the weight at which that caterpillar left the egg. If we want another hearty feeder, let us buy a few eggs of the silkworm moth, let them hatch, and watch the caterpillars at mulberry leaves. When the caterpillars are all at work on their meals, their munching sounds like the rustling of paper.

HOW THE CATERPILLAR CASTS ITS SKIN AND BECOMES A CHRYSALIS

The chief aim of the caterpillar's life is to be fat and strong in readiness for the great day when its form must be changed. That is the day upon which it turns into a chrysalis. We must look back, afterwards, to the precautions taken in readiness for this day—to the cocoon-spinning, and so forth. Here we can go straight on with our story, because, as we have seen, the butterfly chrysalises make little preparation in the way of spinning. The last moult of all comes on this day.

We leave our caterpillar looking fat and lazy. When we return to his little home we find a caterpillar no longer. There, on the floor of the case or box, lies his old skin; beside it is a smooth chrysalis, or pupa, looking something like a date-stone. But this time the moult has taken everything. Head, eyes, jaws, claws, legs, and claspers—all are gone. Nothing but this smooth little horny cylinder remains. It is as if our handsome caterpillar, which we have fed from its birth, had died, and left us nothing but a small ringed tube to remind us of the past. No one would think that there was life in the chrysalis. But take it up carefully and let the warmth of our hand be felt by the chrysalis, and the latter will wriggle, perhaps because it is annoyed—if a chrysalis is so silly as to feel annoyed—perhaps because it likes the warmth.

THE MIRACLE OF A BUTTERFLY'S BIRTH FROM A CHRYSALIS THAT LOOKS DEAD

Whatever the case, there is our caterpillar turned to a pupa, or chrysalis, and in that state it lies like a dead thing for days and days. We see nothing from the outside beyond the dull, horny cover, which is about as interesting as an empty shell. But within that covering a miracle is being performed. The body of the caterpillar is being remade while we wait. It may take only a fortnight if the weather be warm at the time. At the end of that period the chrysalis will open at the top end; the top ring will come off like a lid, and a lovely moth or butterfly will creep out. The big, biting jaws for eating vegetation have gone, the true legs in front and the stumpy false legs at the back have disappeared, and new legs have grown in front.

When it comes out of the chrysalis shell, the moth or butterfly is as big as it ever will be. At first its wings are damp, and its legs are weak and trembling, and the poor thing seems quite faint. But the warm air soon dries its wings, and very shortly the butterfly starts up into the air; and there before us is one of the loveliest creatures in all creation. We have watched the whole process from the time that the butterfly laid the egg. We have seen the egg turn into a caterpillar, and the caterpillar turn into a chrysalis, and we have now seen the chrysalis turn into a butterfly.

But all this may have taken only a few weeks. The cabbage butterfly, as we all ought to know, lays two batches of eggs every summer, and those eggs quickly hatch. Where, then, is the year's entertainment which the process was to afford us? The answer is that we must not depend upon one species.

A QUICK-CHANGING CHRYSALIS AND A CHRYSALIS THAT SLEEPS ALL WINTER

We must have a caterpillar which will quickly turn into a chrysalis, and from that to a butterfly. But we must have also a caterpillar which, after becoming a chrysalis, will last through the winter in that state, and be a feast of wonder for us until the glad days of summer come again, when we may renew our store of eggs and continue the hatching process with other varieties.

The chrysalis stage, though it is rather trying to the impatient, is one of the most marvellous things in Nature. In the study where this story is written many caterpillars and butterflies have been born. A little girl and a friend have splendid times in this butterfly nursery. She never fails to find him some big, fat caterpillars, and he in return seeks among the bushes and finds clusters of others in their webs, or the eggs of moths and caterpillars laid upon out-of-the-way leaves. Between them, this clever little girl and her friend brought up a big family of the loveliest silver, pearly moths, speckled with black.

They took the caterpillars from a variegated privet-bush, and fed them on fresh leaves every day; and saw them weave themselves into webs, and finally wrap themselves up, one by one, each in its little nest of spun silk, and each leaving its skin outside. And then they saw them hatch into these lovely moths, and finally turned them loose in the garden from which the caterpillars came.

HOW A LITTLE GIRL'S HAIRY CATERPILLAR CHANGED INTO A FAT CHRYSALIS

Of course the gardener would not be at all pleased about the moths being turned loose, for their caterpillars damage the trees and shrubs that he so lovingly tends; but not even skilful gardeners can have all their own way.

In this study, which is also a nursery for butterflies and other things, there rested all the winter days a great fat chrysalis. Before, it was a fine hairy caterpillar, gay with black and gold. It was the little girl's "find," and they kept it in the big box which was the cradle of the others. Its caterpillar life was passed in the pleasant days of summer; in the chrysalis form it braved the cold days of winter. People, looking at it, thought that the chrysalis was dead, but its two keepers knew better. They knew that they had only to hold it for a minute or so in their hands for the warmth to make the chrysalis stir and wriggle. They knew that in the warm days of early summer the dark old case would be split open at the top, and that there would come forth a lovely great moth.

We think it wonderful that bears and other animals should have the power to sustain life while sleeping all through the winter, but surely it is far more wonderful that so little a thing as a caterpillar should be able to store up within itself strength enough to carry it all through the terrible days of winter.

SOMETHING THE GENTLE CATERPILLAR CAN DO THAT THE FIERCE WASP CANNOT DO

The big, fierce wasps cannot do this; only their queens live through the winter. This power is one of the gifts which Nature has bestowed upon the caterpillars of moths and butterflies. Others of their order can sleep through the worst of the summer days in the scorching lands where winter never comes. They remain in the chrysalis stage when the vegetation is scorched up, and come out when flowers and fruit are in their glory.

So far we have thought only of the caterpillars that pass their time in the open in an average American garden. There are others which are compelled to take greater precautions. One family of caterpillars cannot live in this way. They are called miners, and live inside leaves. By the most skilful method of cutting, they bore their way into leaves, and make a chamber actually inside the leaf. They feed on the inside of the leaf. They gnaw at the fibrous stalks, or nervures of the leaves, to make them smooth and level with the flesh of the leaf, and when they have made the chamber within the leaf large enough, they spin a complete covering of silk, as if the interior of the leaf were too rough for their tender skins. Another caterpillar, not satisfied with his retreat in the stalk of a plant, makes a sort of trap of bristly hairs at the entrance, with the spikes pointing outwards, so that while he can go out, no deadly insect can get in to eat him up.

A POOR LITTLE CATERPILLAR THAT COULD NOT BECOME A CHRYSALIS

And that brings us to one of the great tragedies of caterpillar life. The little girl of whom we have been reading had a caterpillar in a poor sort of cocoon for weeks and weeks. She noticed that it had not been able to cast its skin as the others had done, and that it repeatedly fell from the top of the box to the bottom when climbing up to spin. At last it settled down in a corner at the bottom of the box, and spun this poor cocoon, and could no longer be seen.

Days passed away, and when the little girl opened the box there was no sign of change in the caterpillar. But each time a fly would buzz out in her face, and make her slam the box indignantly, and ask: "Who has been putting these nasty old flies into the caterpillar box?"

At last the little girl's friend got his magnifying glass, and carefully examined the cocoon. Then he cut the cocoon out of the box, and was able to explain the mystery. The body of the caterpillar inside the cocoon was dried and hollow; it was a mere wrinkled skin. All round it were tiny chrysalis cases—empty. It was from these little cases inside the cocoon that the flies, which annoyed the little girl, had come. When the caterpillar was at liberty in the garden, an ichneumon fly had perched upon it. Driving her sharp needle into his back, she had made little holes, and in each she had deposited one of her eggs. These eggs were in the body of the caterpillar when the little girl caught it. The eggs had hatched in the caterpillar's body, and little grubs had come forth from them and eaten the flesh of the caterpillar. Then they had changed into chrysalises, and at the right time had burst their cases and come forth as fully developed ichneumon flies, ready to fly out when the little girl opened the box.

CATERPILLARS THAT HIDE IN TREES AND CATERPILLARS THAT GROW HORNS

That is a horrid tale, is it not? But it is the sort of thing that is going on around us in the gardens and fields and woods every summer's day. The caterpillar lives until the grubs of the fly, hatched from their eggs, eat it up. It is supposed that the caterpillar feels no pain; that its nerves are paralysed by the mother ichneumon, but that it has just strength enough to live until the little flies hatch.

That is only one of the dangers of the caterpillars. The birds devour myriads of them. Some, to avoid their enemies, bore their way into the decayed trunks of trees, and there undergo their change. When they are about to turn into chrysalises, they work their way near the bark of the tree, so that the moth which comes forth in due time shall have no difficulty in making its way out. Other caterpillars are covered with hairs, which not only serve to protect them if they fall, but make birds dislike them as food. The cuckoos live almost entirely on hairy caterpillars which other birds will rarely touch. Big hawk moth caterpillars have horny hooks over the rear segment of the body, and they look quite formidable as they whirl from side to side when handled. The sphinx caterpillars try to frighten enemies by assuming the most alarming attitudes. Others feign death, and some crawling about twigs can so imitate the look of a dry twig that they escape the eyes of their enemies.

ARMIES OF CATERPILLARS THAT STRIP FORESTS AND STOP TRAINS

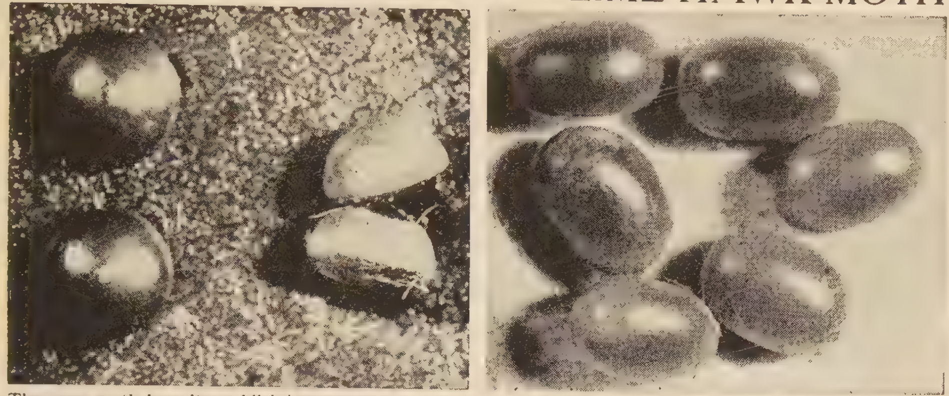
A whole book might be filled with the wonders of caterpillar life, about their spinning and building, and so forth. The silkworm itself demands special mention, and we shall have a story about that in another part of the book. The subject of the damage done by caterpillars is, of course, very important, but we must leave that, remembering that the ravages of these insects are so severe in some years that they can strip a forest of leaves, and when on the march, go in such enormous multitudes that they can even stop railway trains by making the lines impossible for the wheels of the carriages to grip. But we must pass on now to the final stage.

As soon as it leaves the chrysalis, the moth or butterfly dries its wings, and flies away to seek a mate. Generally the males are the more handsome. A bright-coloured female might attract attention while she was laying her eggs, and she would be killed. With the males it does not so much matter, as after a few short days their lives end. Even they, however, have in many cases means of protection. As they fly with gorgeous wings outspread, lovely as the birds of paradise, one might think that they could not escape detection. But watch one of the handsomest as it settles. In a twinkling the butterfly which we have watched to a tree or a bush has vanished.

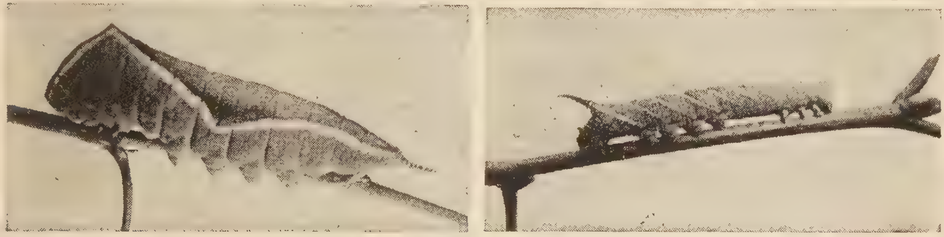
HOW BUTTERFLIES CLOSE UP THEIR WINGS AND BECOME INVISIBLE

The wings are brought upright together over the butterfly's back, leaving only the under sides showing, and the colouring here very much resembles the colour of the branch on which the insect rests. The glory of the butterfly, which would betray it to enemies, is hidden by this provision of Nature. The gay wings close up over the insect's back, like

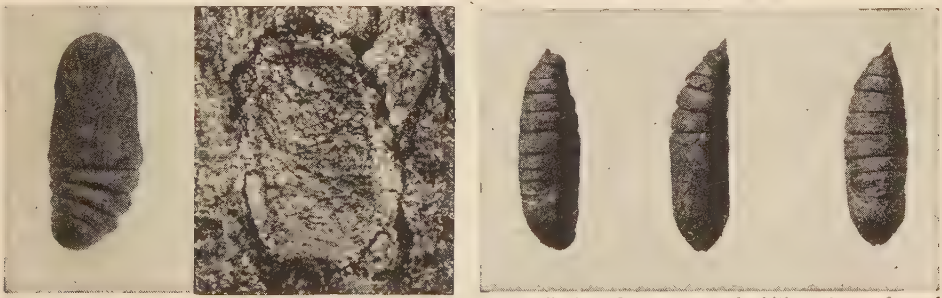
THE PUSS MOTH AND THE LIME HAWK MOTH



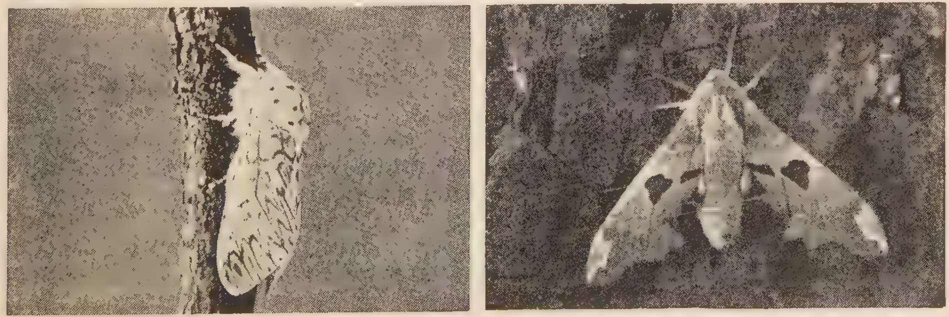
The puss moth lays its reddish-brown eggs on the leaves of poplar and willow trees, where they pass unnoticed; but magnified a hundred times they appear as in the left-hand picture. In the right-hand picture we see the eggs of the lime hawk moth similarly enlarged. These are laid on lime or elm leaves, and are a dull green.



On the left we see the caterpillar of the puss moth, which changes from black to a bright velvety green with white stripes. It has a curious sphinx-like appearance when resting, and from its tail throws out two scarlet threads that frighten away ichneumon flies that attack it. On the right is the caterpillar of the lime hawk moth.



When the puss moth caterpillar is about to change into a chrysalis, it makes a cocoon by biting pieces of wood from the bark of a poplar or willow, and cementing these into a substance so hard that it will break a penknife blade. It is the same colour as the bark, and is difficult to find. On the left we see the chrysalis and cocoon of the puss moth. On the right are three chrysalises of the lime hawk moth, whose caterpillar is transformed underground.



Here on the left we see the furry puss moth, which gets its name from its supposed resemblance to a tabby cat, although its colour is really black and white. On the right is the lime hawk moth, the caterpillar of which feeds on lime leaves. Its colour varies, but it is usually leaf-brown and green, with black spots and stripes.

the leaves of a book, and the parts of its body which are visible resemble its surroundings. Even our common cabbage butterflies are difficult to see when they settle and close their wings.

By a gradual process the handsome butterflies have made themselves, when still, like the colour of the twigs or foliage on which they rest. Some of the most beautiful look just like dead leaves when they rest on a tree. But others have done a more wonderful thing. It is impossible to explain how they have done it, but some of the biggest and handsomest have made themselves like other insects known to be poisonous or in other ways distasteful to birds. These imitative butterflies may be seen flying about slowly, not at all alarmed by the presence of birds that eat butterflies.

The food of butterflies consists, as a rule, of the nectar of flowers, but there are exceptions even among the loveliest. One of the finest and largest butterflies we have in this country is the Purple Emperor. He flies high among the tree-tops, and is not easily to be seen. There is a way to bring him down, however, and that is to set a bait of putrid flesh. He will come down readily enough to that, although he cannot bite it.

FAMOUS BUTTERFLIES AND A BUTTERFLY THAT FLIES THREE MILES HIGH

He has neither jaws nor teeth; those he left behind when he turned from a caterpillar into a chrysalis. He has a long sucking-tube, and with this he sucks the fluid out of the meat. The more handsome the butterfly, the more certain is it that he will like this sort of food. And he and others will drop to the ground to drink from the water of a puddle.

The finest of all our butterflies is the Swallow Tail. Other famous ones are the Marbled White, Scotch Argus, White Admiral, Red Admiral, Peacock, Large and Small Tortoiseshell, Camberwell Beauty, Painted Lady, Brown Hairstreak, the Fritillaries, the Large Copper and the Cabbage butterfly, and, of course, the Purple Emperor. Specimens of several of these may be found in all temperate lands. It is surprising how far the butterfly really does go. Of course, we expect to find it in hot countries, and we do find it there, in enormous numbers—thousands of species, as large as birds, some of them, and lovely as a poet's dream. But in the frozen lands, in the short days of summer, we find butterflies; and high up mountain-sides, where it is cold and bleak, 16,000 feet and more up, there also we find butterflies. They can fly far, too. Darwin saw them out at sea in such clouds that, though he used a telescope, he could not find where the swarm began or ended.

VAST CLOUDS OF BUTTERFLIES THAT TAKE DAYS TO FLY PAST A PLACE

In Ceylon a traveller saw such a multitude of them that it took days for the whole host of them to pass.

The life-story of the moth closely resembles that of the butterfly, except that most moths prefer the night hours in which to fly. There are thousands of species of them, from the monsters called owl moths, measuring nearly a foot across the extended wings, down to the little moths which good housekeepers so fear. Most of the moths have the same sort of food as the butterflies, and lay their eggs on plants which serve the caterpillars as food.

The clothes moth is one of the smallest of the family, and because of its bad reputation is one of the things most disliked. Let us say a good word for it. The moth does not want our *clothes*. Its purpose in life is to act as a scavenger, to eat up wool and hair and feathers discarded by animals and birds, or left by those which have died. But if we have the windows open and a light shining at night when the little moth flies from her hiding-place, she is bound to fly in—the light draws her. And once in, the moth thinks it might as well stop. So it creeps into the wardrobe, or clothes-chest, or, it may be, into the carpet or the stuffing of the furniture, even into the rugs with which we clothe the horse in the stable. There it lays its eggs and dies. The moth itself never eats clothes. It does not eat anything at all. It is the caterpillar from the egg which does the damage.

THE CATERPILLAR THAT EATS OUR CARPETS TO MAKE A HOUSE FOR ITSELF

This is a marvellous little worker. It eats wool and the fur for its meals, and it converts more wool or hair into a little house for itself. Having no shell of its own, it makes one by chewing hair or wool and making it into a sort of silk. This case it never leaves. As it grows bigger the caterpillar splits open its case, adds a length to the end in front, and a length to the end in the rear, and spinning a new section, joins it entirely along the whole side, then seals up the case once more. When it walks it pops out its head and front legs, and draws its case with it.

The damage that it does results from its not only biting up the wool or fur for its food or for its house; like some of the ants, it must have a straight, smooth path along which to walk. To secure this, it bites the fur or wool quite level with its scissor-like jaws, so that its path may be plain and easy wherever it goes. Before turning into a chrysalis it spins threads which fasten its nest to the article upon which it has rested. It remains three weeks in the chrysalis case, then comes forth as a moth, lays its eggs and dies.

Another famous moth which we must notice is the death's-head moth. This is the one which we read about in the story of the bees. It is a fine, handsome moth, with a great love for honey. So it creeps into the hives to feed—the bees know that it has no right there, that it is a robber of their store.

A BIG MOTH THAT LIKES HONEY AND SQUEAKS TO FRIGHTEN THE BEES

But the big moth has a voice, and pipes away in notes like the note of the queen bee. The voice of the queen bee always terrifies the bees, and the voice of the death's-head moth seems to have the same effect upon them. Instead of killing the moth with their stings, as they easily could, or sealing it up as they seal up the snail, they merely build walls of wax to prevent the robber from getting at their store. This leaves open a passage along which they can run, but is too small for the moth to enter. It is surprising that some of the day-flying moths do not imitate the death's-head moth, for there are several species shaped and coloured just like bees and wasps. Their shape and colour are a part of the great plan known as protective mimicry, by which various forms of animal life are enabled to make themselves either like other living species, or like their surroundings.

The females of some moths never use their wings. The females of the Vapourer moths, after quitting the chrysalis stage, deposit their eggs on the outside of the cocoon, while the female Psyches never leave the cocoon at all. We have a moth in our American orchards whose female has but feeble wings. It is a mercy that this is so, or we should have very little fruit. The eggs of the moth are laid in the branches of the tree, and the caterpillars are so numerous and so hungry that they can completely strip a tree of its leaves and buds. One farmer in Ohio went into his orchard at midsummer and found the fruit-trees as bare as if it were the depth of winter.

MOTHS THAT CANNOT FLY, BUT CLIMB TREES TO LAY THEIR EGGS

When the chrysalis forms it drops to the ground, and there the moth is produced. Now, as the female cannot fly, when she wants to lay her eggs she has to reach the top of the tree by climbing up the trunk. So the fruit-growers, who have learned the secret, put bands of a special sort of paper round the trunks of their trees, and on this paper they spread bird-lime or other sticky stuff. When the moth starts to climb up the tree, she is caught on this sticky band. Then, as there are no moths to lay eggs in the trees in the autumn, there are no caterpillars in the following spring to destroy the farmer's leaves and kill the trees.

We cannot protect our vegetables against the cabbage butterfly in that way. It is there that the ichneumon fly saves us. If all the eggs of the cabbage butterflies came to maturity, there would be no vegetables left in the country.

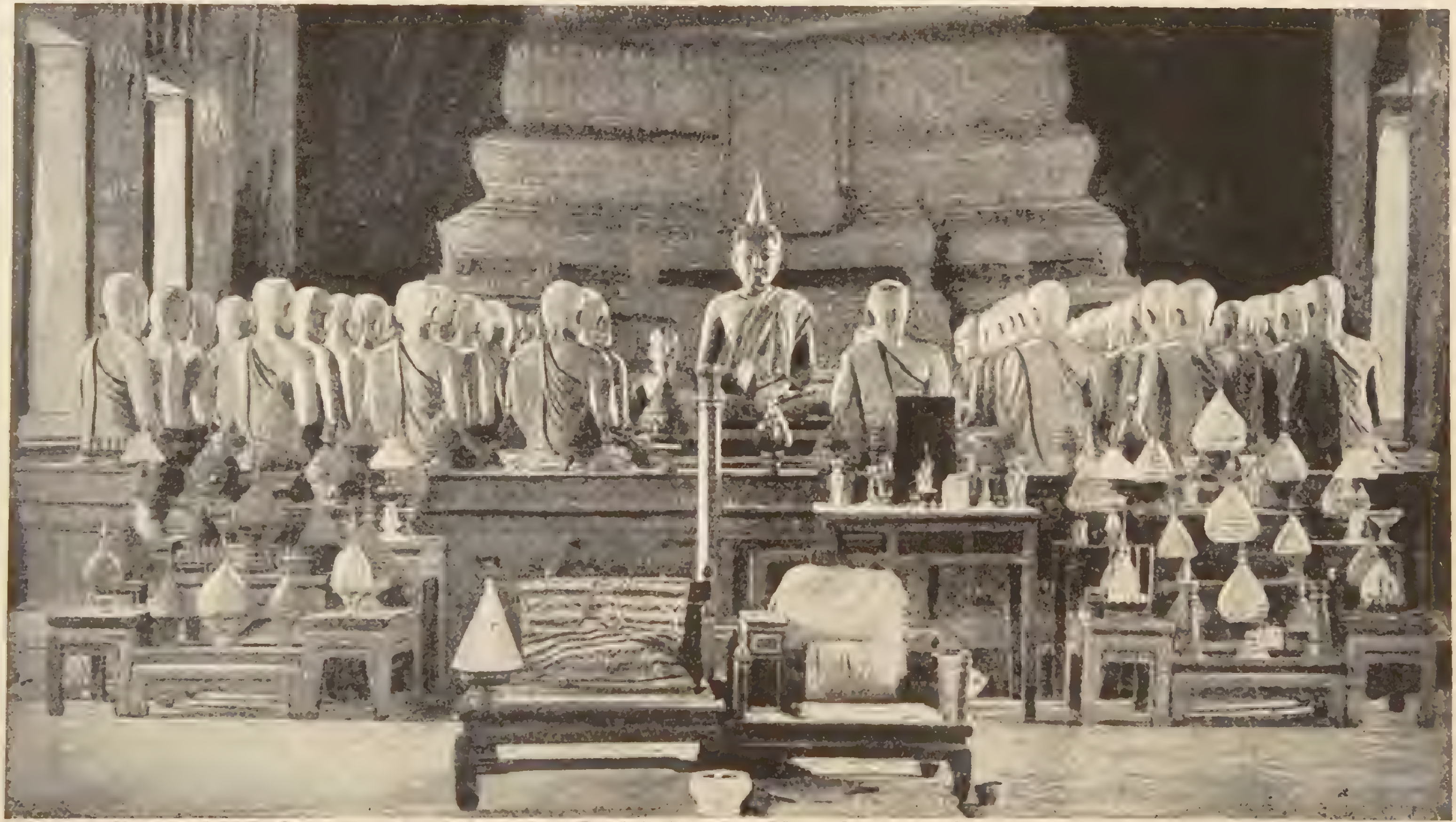
Many moths and butterflies do not live long enough to lay two lots of eggs in a year. Most of them die as soon as their eggs have been laid.

WHY WE SOMETIMES SEE BUTTERFLIES FLYING ON A COLD WINTER'S DAY

But some get into a sheltered nook before the weather turns cold, and in that condition slumber away the winter, to be awakened by the first warm, sunny day that comes. That is why, on a warm day in winter, we may sometimes see butterflies on the wing. That may happen also from chrysalises being turned, by the warm weather, into the perfect insects before their due season. For the most part, however, the eggs or the chrysalis remains quiet and inactive during the winter months, and when summer comes, then come also the little-known beauties of the moths and the gay splendour of the butterflies.

The next story of Nature is on page 3139.

BUDDHA TEACHING HIS PUPILS THE VANITY OF HUMAN DESIRE



This remarkable group of lifelike figures is to be seen in a pagoda at Bangkok, the capital of Siam. It represents Buddha, "the Enlightened One," teaching his pupils, each of whom is dressed in the robe of a Buddhist priest, and has his name on a marble tablet affixed to his statue. All the pupils are sculptured life-size, while Buddha is greater than life-size.

CONFUCIUS ZOROASTER BUDDHA MOHAMMED LAO-TSZE

SOME FOUNDERS OF RELIGIONS

CONTINUED FROM 2914

MAN in all ages has been puzzled to know why he exists, and how this earth came into being. Directly he began to think, he found himself surrounded by mystery. He looked around him, and saw the beauty of the fields, the majesty of the hills, the wonder of great waters; he looked upward, and fixed his gaze upon the uncountable stars; he turned his gaze inward, and saw, as it were in a mirror, himself, his own thought, his reflection of "I am I." What did it all mean? Whence? For what purpose? Whither?

Among those who wondered there were some who meditated and reflected. Their meditations led them to believe certain things. They spoke of these beliefs. If their beliefs satisfied the ideas of men, they became teachers. They spent their lives in teaching, and at their death others continued to deliver the message.

Who these earliest teachers were and what they taught we shall never know accurately. The earliest religious guesses of the human race are lost in the silence of the past. It is quite late in the history of humanity that we come upon religious teachers whom we can name, and whose teachings are more or less clear to us. But these men, it must be carefully remembered, had inherited a teaching which goes back to the remote ages of the human race. Two of the teachers whom we meet in the past were natives of India, Gautama, the founder of Buddhism, and Vardhamana, the founder of what is called Jainism. In India, philosophy, which means search after truth, deeply occupied men's minds. Life was easy there; people had much time to sit down and think; and some gave themselves up entirely to guessing at the riddle of man's existence. India may be called the cradle of religion—certainly the cradle of dreamy guesses.

Some five hundred years before the birth of Christ, the two men of whom we have spoken were born in India. The religion of that time was Brahmanism, a loose set of ideas into which we need not inquire. The point is that Brahmanism did not satisfy either Gautama or Vardhamana.

Gautama was the son of an influential man, some say a rajah, or king. He was brought up in a palace, and the world was kept hidden from him till he was married. While he lived in the palace, Brahmanism satisfied him. Alas! his first excursion into the world shattered his beliefs. He saw a broken-down old man, then a sick person, and at last a corpse. These things seemed terrible to his soul. He felt that life was a horror. He sought to escape from it. Leaving his wife, his new-born babe, his father, his friends, his wealth, and his palace, Gautama went out into the wilderness, alone and penniless and homeless, to think about life.

He came to the conclusion that all solid and material things are useless and quite unworthy of men's affections, because they have the germ of death in them and will pass away. Nothing is worth while. Everything dies. He accepted the conclusion that man is born on this earth not once, but many times, and, because each time his spirit is filled with foolish and vain desires, the great object of life should be to destroy all desire. When once a man wishes for nothing, absolutely nothing, when his spirit is filled with nothing but a complete willingness to perish, then at death he passes out of the world for ever, enters something called Nirvana, which no European can understand, and is blessed for ever by being for ever non-existent. He ceases to be. Gautama preached this doctrine and called himself the Buddha, which means the Enlightened One.

It is the most curious religion in the world, if it can be called a religion at all, this Buddhism of Gautama. At one moment you feel how beautiful it is; at the next you are inclined to laugh at its apparent uselessness.

THE WOMAN WHO CAME TO BUDDHA AND LEARNED THE SADNESS OF LIFE

Here is a typical story of the Buddha. A poor woman came to him one day with a dead child in her arms. She was wild with grief, and implored the Buddha to give her medicine which would heal her child. Whatever herbs he needed for this medicine she would fetch him, even if she had to go to the ends of the earth. He told her to fetch a little common mustard seed, adding that it must be brought from some house in which no son, or husband, or parent, or slave had died. The woman went away eagerly to fetch the simple mustard seed.

"Here is mustard seed," everyone said to her. But when she asked if any had died in that house, the answer was:

"Lady, the living are few, but the dead are many."

For a long time she journeyed, and then, seeing the truth of things, namely, that death is common to the race, she left her dead baby, and returned.

"Have you the seed?" asked Buddha.

"My lord," she answered, "the people tell me that the living are few, but that the dead are many."

Then the Buddha taught her the great sadness of life, and filled her with the desire no longer to exist. As a matter of fact, the whole teaching of Buddhism in regard to human life is the direct opposite of Christianity.

THE BUDDHIST WHO SEEKS NOTHING, AND THE CHRISTIAN WHO SEEKS EVERYTHING

Buddhism, filled with the melancholy of despair, says: "Nothing is worth while." Christianity, filled with the vigour of hope, shouts: "Everything is worth while." The Buddhist is careless of life and indifferent to suffering. The Christian believes that life is good, and builds hospitals to cure the sick. Buddha did not tell people to struggle, did not bid them repent, issued few rules of conduct. His whole mission was summed up in this—disgust for existence, here or anywhere. If a man felt remorse for his sins, it showed that he wanted to do better. He must want nothing at all.

Buddhism spread among the peoples of India, and at the death of Buddha it spread still more. Its progress was checked, however, among the northern peoples, who believe in opposing themselves to Nature, and refuse to resign themselves to fate. It is a purely Eastern religion, lacking altogether a universal note—it could never convert the world.

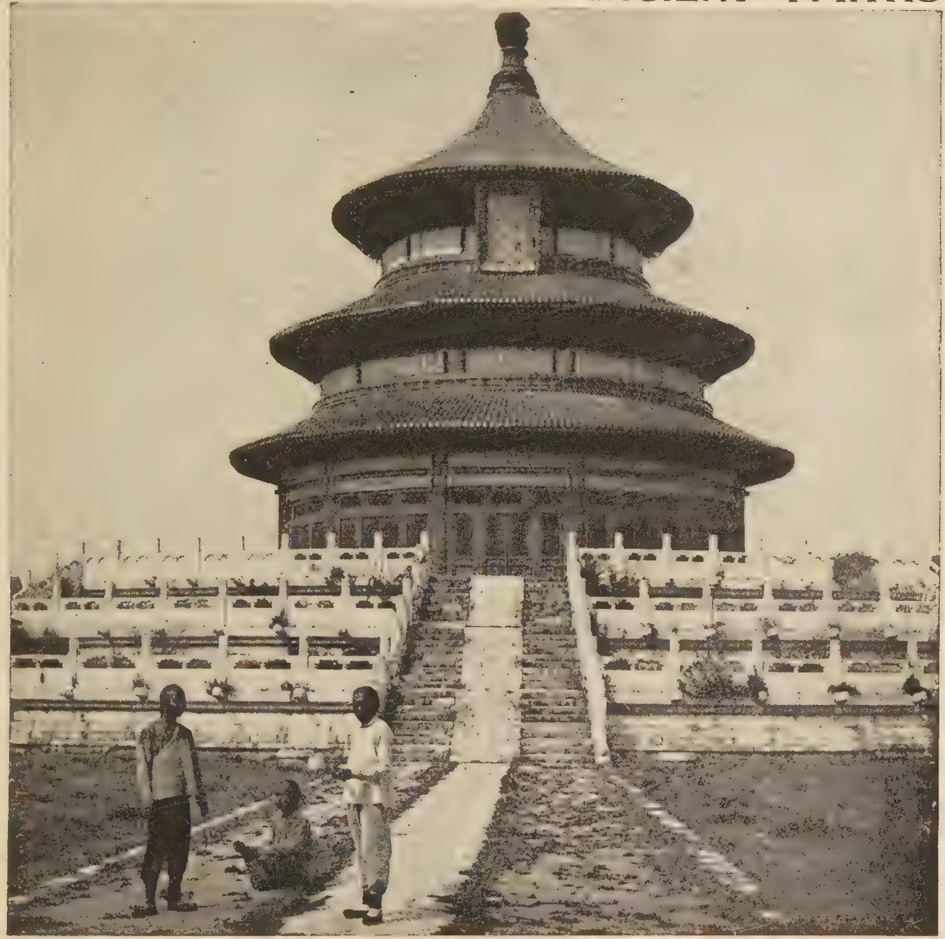
Vardhamana did not like the Buddha's teaching, and taught a very different religion. Vardhamana, we may think, was a truer teacher than the Buddha, but, unfortunately, he did not possess the same genius, the same attractiveness, as the other. His converts were fewer.

In the midst of much unintelligible stuff about Nirvana, there is a kernel of solid virtue in Vardhamana's teaching. He taught that everything has a soul, the soul being the "life"—so that grass, trees, animals, even water, have souls.

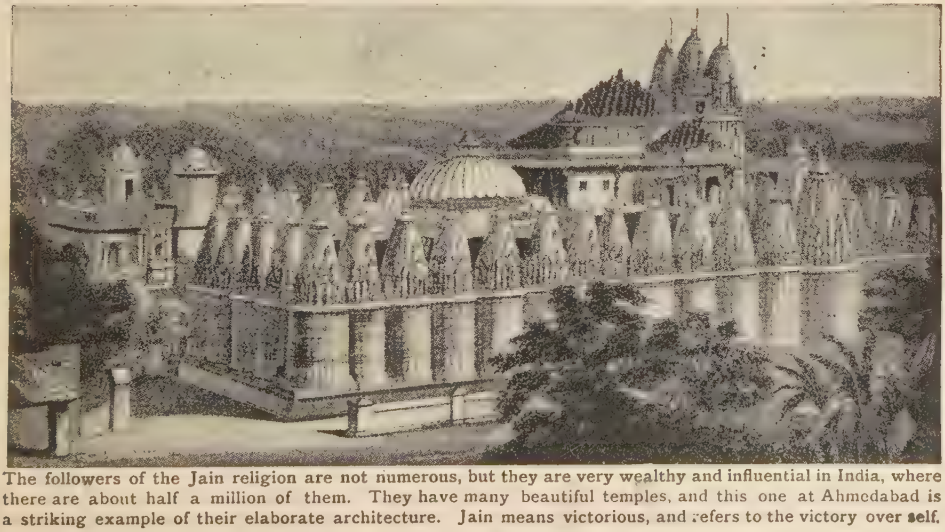
A TEACHER OF HOPE WHO FOLLOWED THE TEACHER OF DESPAIR

It is the fate of this soul to journey from body to body for millions of years, and the only escape from the toil of existence lies in practising four virtues—liberality, gentleness, piety, and repentance. One must be good in word, thought, and deed; kindness to animals is essential. So we see that Jainism is better than Buddhism, because it makes for action instead of for despair and resignation; but the goal

SPLENDID TEMPLES OF ANCIENT FAITHS



The great Temple of Heaven at Pekin is the most sacred spot to the followers of Confucius. There every year, on a great outdoor altar of porcelain, the Chinese emperor kneels and prays for the favour of Heaven. Then sacrifices are offered, and as the emperor bows and touches the ground with his forehead, all his courtiers do the same.



The followers of the Jain religion are not numerous, but they are very wealthy and influential in India, where there are about half a million of them. They have many beautiful temples, and this one at Ahmedabad is a striking example of their elaborate architecture. Jain means victorious, and refers to the victory over self.

appears to be the same—an escape from life. Christ, on the other hand, created in men a passionate desire for life; life, and ever more life; life which fulfils itself in adoration of God, who wishes all His children to be happy.

Nothing is known of Vardhamana, but the Jains still exist, and are very rich.

A GREAT CHINESE TEACHER AND THE CURIOUS LEGEND OF HIS BIRTH

Curiously enough, about a century before the existence of these two teachers in India, there lived two teachers at one and the same time in China. The one was Lao-tsze, who founded what is called Taoism; and the other Confucius, the founder of Chinese philosophy.

The meaning of the title Lao-tsze is nothing more or less than "Old Boy," and legend has it that he was born in a miraculous way, being no less than eighty years old at the time of his birth, his head being covered with white hair, and a venerable beard descending from his chin. But a more appropriate translation of "Lao-tsze" is to make it "the Venerable Philosopher"; and of course the story of his birth is simply a legend.

He was born in a hamlet, and became librarian to the king. In the royal library he pondered over the mysteries of life, and after many years he came to a conclusion. which was that the great thing, the supreme virtue, was humility. Desiring to hide himself, he left the palace and set out for the wilderness. As he was passing through the gate, the warden, who knew him for a holy man, said:

"You are about to withdraw yourself from the world. I pray you write me a book before you go."

Lao-tsze thereupon sat down and wrote a book about half the size of St. Mark's Gospel. He gave this to the warden, passed through the gate, and no man knows where he died.

HOW LAO-TSZE WROTE A GOSPEL AND TAUGHT MEN NOT TO BE ANXIOUS

The little book is the gospel of Taoism. From those few pages grew up an immense religion. If Lao-tsze could stand in that gate now, he would be amazed to see the effect of his farewell to the warden. Let us see how much we can understand of Taoism.

The word "Tao" is the despair of translators. It means "the way," but it means "the wayfarer" as well. It is man and his destiny; God and humanity. We cannot say exactly what a Chinaman understands by it. Lao-tsze's advice is that we should think and act without reflection. We should become like young children. The grass grows without taking thought; man should live with a similar freedom from anxiety. Everything should be spontaneous, everything done on the impulse. But he carries this advice almost to the point of anarchy. "It is the way of Tao," he says, "not to act from any personal motive, to conduct affairs without feeling the trouble of them, to eat without being aware of the flavour, to account the great as small and the small as great, to recompense injury with kindness."

He hated war; he did not like to see men put to death. He felt no interest in art, culture, and refinement. Life should be without effort. There could be no beauty where there was strain. The pilgrim of existence should never be in haste about anything, never be anxious.

THE BOY WHO PLAYED AT PREACHING AND BECAME THE SAGE OF CHINA

We see that, unlike the two teachers of India, this old philosopher wanted people to be happy; but we cannot help feeling that here also is that despairing "fatalism," or the belief that everything is pre-arranged to happen, whatever man may do, which is the ruling idea of the East as distinct from the West.

A very different man is Confucius, the great sage of China. Confucius and Lao-tsze once had a conversation together. Lao-tsze did not think much of Confucius. Confucius was struck by Lao-tsze. Now, which should we say was the greater man? It was Confucius. It requires genius of the highest order to appreciate those with whom we do not agree. Confucius was born of an ancient and honourable family; but he was poor. In order to earn his living, he studied hard in childhood. He was fond of music, and played on the lute, singing to it. His favourite game with other children was what we should call "playing at being a clergyman." He liked to dress himself up, to strike attitudes, and to conduct religious sacrifices. He was married at nineteen, and became a keeper of stores, and afterwards the controller of parks and herds.

He was twenty-two when he set up as a teacher, and it is said of him that

MOHAMMED DICTATING THE KORAN

Every Mohammedan has the greatest reverence for the sacred scriptures of his religion, called the Koran a word that means "book," just as our word Bible does. Mohammed pretended that the chapters of the Koran were brought to him from heaven by the angel Gabriel, and to confirm this, pointed to the fact that he himself could neither read nor write. But the general opinion of scholars is that he dictated the Koran.

The photograph of the top picture on page 2997 is by H. C. White & Co., London, and that of Buddha on page 2995 is by Frith.

he never refused a scholar who was too poor to pay his fees. But he used to say that when he had explained one corner of any subject, if the pupil could not understand the other three corners for himself, he gave up teaching that lesson.

His fame spread as a teacher, and he became a minister to one of the rulers. So great was his success that he became "the idol of the people, and flew in songs through their mouths." He put down injustice, and banished crime. He was just, honest, fearless, and good. But the ruler began to grow jealous of his power, and Confucius had to go.

The rest of his life is a pathetic tale of homeless wanderings. Accompanied by his disciples, he journeyed from state to state, seeking some ruler wise enough to accept him as teacher and minister. He told his disciples that the greatest reform was to make people understand the meanings of such names as "ruler," "father," "son." If those words were properly understood, unhappiness and misery would vanish from the earth.

HOW THE TEACHER OF CHINA SOUGHT A KINGDOM BUT FOUND NONE

On these wanderings he frequently encountered hermits—men who had retired from the world in disgust. These hermits could not understand how Confucius could be so stupid as to live in a wicked world trying to alter what was unalterable. Confucius said it was impossible to withdraw from men and live with beasts and birds who did not understand man. "With whom should I associate," he asked finely, "but with suffering man?" So he walked on and on, teaching his disciples, comforting the poor, and seeking for a kingdom to rule.

He found no kingdom. But his teachings have lived from the day of those sad wanderings down to our own time, and Confucius now reigns as no other emperor can reign in the hearts of millions and millions of the human race.

One of his sayings shows the great difference between him and Lao-tsze: "The cautious seldom err." But his whole gospel was more generous than that; he taught the golden rule that we should live exactly as we would have others live: "What you do not like when done to yourself, do not to others." His whole teaching shows that we should do good to others, whether there is need for us to do so, or not. But he said nothing chivalrous or noble about women, and he gave no attention to a life after death. "While you do not know life," he said, "what can you know about death?" All his ideas of goodness concerned man's life on this earth, and it is wonderful that a teacher who left wholly out of account life after death should have had, and still does have, such immense influence over men.

THE PROPHET OF PERSIA WHO LAUGHED THE DAY HE WAS BORN

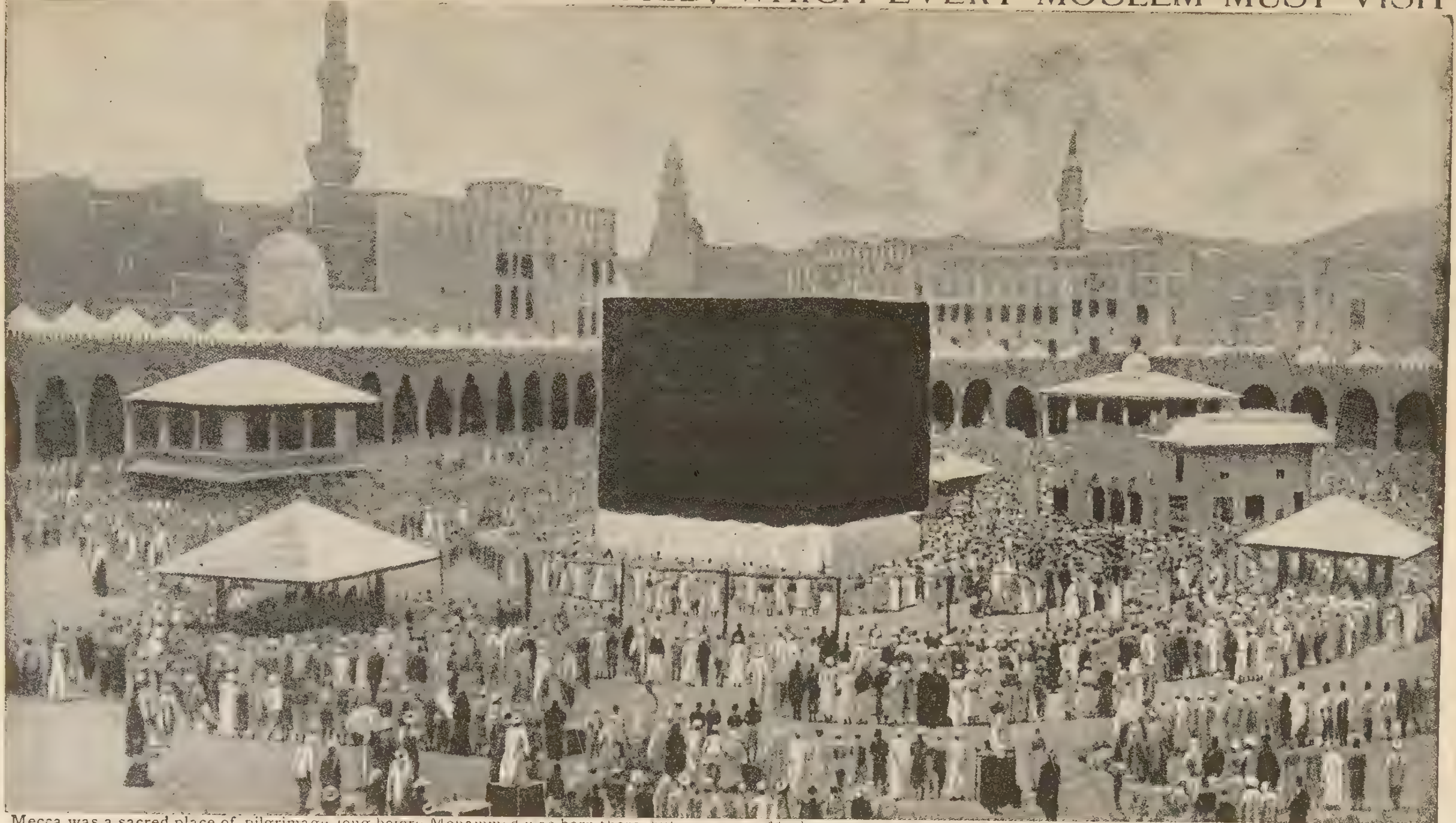
Further back in time than any of these men is the founder of Zoroastrianism, the ancient religion of Persia. Some say he lived before the battle of Troy, others that he was Ezekiel, others that he was Ham, Moses, or Abraham. There is no end to the theories about Zoroaster. The legends about him are also legion. It is said that he began to laugh the day he was born; that the palpitation of his brain was so vigorous that it repelled any hand that might be put upon his head; that he dwelt twenty years in the wilderness and lived upon a single cheese which never grew stale. It is also said that as he came down from meditating in a mountain, fire burst out from heaven which did not consume him; that he desired to be killed by a thunderbolt, and that in this manner he did die, after having taught the Persians all there is to know about this world and the next.

We need not trouble our heads about this enormous nonsense, which always grows up about the original men of antiquity. We may be certain that a man named Zoroaster did live, that he taught the Magi, or Wise Men, of Perisa, and that his character was sufficiently unusual to make him revered and honoured and obeyed by his disciples.

THE GOOD GOD OF THE LIGHT AND THE EVIL GOD OF THE DARKNESS

Zoroaster divided everything into good and evil. There was a good god and an evil god. Some of the animals, birds, fishes, and plants are made by the good god, and some by the evil. He taught that sacrifices should be made to the good god in order to win from him all manner of good things; and to the evil god also, that he might guard the offerers from dangerous and hurtful and unpleasant things. Light belongs to the good god, and darkness to the bad. The name of the good god is Ormuzd, and the evil Ahriman. Life after death

THE BIRTHPLACE OF MOHAMMED, WHICH EVERY MOSLEM MUST VISIT



Mecca was a sacred place of pilgrimage long before Mohammed was born there, but now every Moslem must turn towards Mecca when he prays, and must visit it at least once in his life. In the grounds of a great mosque stands the holy kaaba, shown in this picture, a small temple which every year receives new hangings of rich material from the Sultan of Turkey. No pilgrim visits Mecca without walking round the kaaba seven times and kissing a sacred black stone built into its wall, which Abraham is said to have received from Paradise.

will be either good or evil, and the whole of our eternal life is determined by our existence here. The soul after death passes over the Accountant's Bridge; its deeds are examined in the book where everything is written; if there are more good than evil deeds, it goes straight to bliss; if the other, it goes straight to pain; and if the balance is equal, it waits in a land of shadow for the final decision of the Great Judge.

You will see that there is some sense and some beauty mixed up in this otherwise absurd religion, which is interesting as showing us what men have accomplished in striving to solve the great and perplexing riddle of existence.

THE ORPHAN BOY WHO BECAME A PROPHET TO MILLIONS OF MEN

And now, last of all, we come to the most recent of religious founders, Mohammed, who is the prophet to millions of the human race, and has sometimes, very ignorantly, been compared with Christ. The truth is that Mohammed probably knew the teachings of Christ. Mohammedanism, some people have said, was Mohammed's effort to rescue the teaching of Jesus from the confusion into which it had been brought by the Christian Church.

Mohammed was born of poor parents at Mecca towards the end of the sixth century. Left early an orphan, he was brought up by an uncle. He was a good boy. At a marriageable age he was sent to act as master of the camels of an elderly woman who traded in Syria This woman fell in love with her young servant and married him. At forty years of age he was the father of a family, with married daughters. Later he had many wives, and is said to have excused himself for beating one by saying that he flogged her as a woman, not as his wife. Some authors say that he was subject to epileptic fits, and that, being ashamed of this infirmity, he pretended that he fell into convulsions because he could not support the glorious sight of the angel Gabriel, who came from God to inform him of things concerning religion.

THE FLIGHT OF MOHAMMED WHO TAUGHT THE RELIGION OF THE SWORD

In any case, he certainly had swoons; and he certainly, on account of his visions, became a feared and honoured person. Disciples gathered about him.

The magistrates of Mecca, fearing an insurrection, determined to put a stop to his ravings, whereupon Mohammed made his famous flight from Mecca to Medina. Here he determined to assert his religion by the sword, and, gathering an army about him, went to and fro, attacking cities and caravans on the road, until at last, after some years, Mecca itself fell into his hands. He died three years after.

It is certain that Mohammed's followers became enthusiastic in devotion to one God, Allah. It is certain that much of Mohammed's teaching is borrowed from the law of Moses. It is almost probable that his ideas were influenced by the primitive teachings of Christianity. He rejected the Church; but he seems, in his own fashion, to have accepted Jesus. But his ideas altogether lack the exquisite clearness and the transparent purity of the Light of the World. They cannot be compared.

The Koran, the scriptures of Mohammedanism, is a wonderful book. Mohammed is supposed to have been inspired to dictate it, or to get it written, by the angel Gabriel. In it there are fables the most monstrous and horrible; but in it, too, there are occasional aspirations towards immortality, and expressions of repentance, which are beautiful.

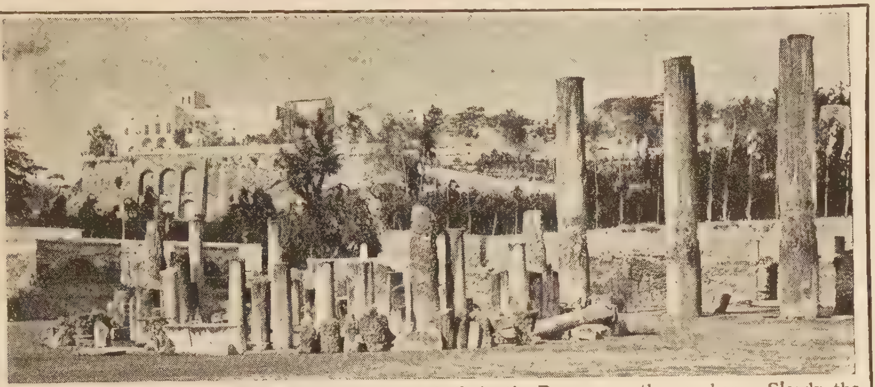
THE KORAN THAT RULES NATIONS AND PREVENTS THEIR PROGRESS

With all its faults, the Koran rules millions of the human race; but it prevents progress. On the whole, it is a book neither very profitable nor very pleasant for any but students of religions. And yet it is this book which Mohammedan children must use as almost their only school-book. Mohammedanism, youngest of all religions, is perhaps the one most distasteful to European knowledge.

The more one compares religions, the more brightly shines the pure and increasing light of the Bible; and, above all, the more we compare the founders of other religions with the pure and beautiful Christ, the more do we feel their utter unworthiness to be compared with Him.

All religions are a struggle from ignorance to knowledge, an effort of man to understand his Creator; but it is in the Bible alone that we seem to find hope.

The next Men and Women begin on 3079.



The Temple of Serapis at Pozzuoli, in Italy, was built by the Romans on the seashore. Slowly the land sank, until at last the sea invaded the temple, and marine creatures burrowed into the stone pillars. About 350 years ago the land again began to rise, and now the temple is above the water, as seen here.

THE EARTH'S CHANGING FACE

CONTINUED FROM 2888

We have begun to learn something about the forces that have long been at work shaping the face of the earth, and we have made the very great discovery that those forces are at work still. When we read what is ordinarily called history, we make the greatest of all mistakes if we fancy that what men did, or said, hundreds of years ago, must be more important than what they are doing and saying now; and so in the history of the earth's face, the present is as important as the past, and the history of the future is now being made by tides and rivers, and rain and wind, just as the future history of mankind is being made by us.

What, then, do we find when we look at the face of the earth as it is at present? For the first answer to this we turn to our maps. As a rule we do not think that there is anything particularly wonderful about a map, but there is a great deal of human history of almost the highest kind printed upon a map, even a map that has no names upon it, and that is all printed in one colour. For ages past brave men, who have had a special genius for travel and adventure, have started out from home to search the earth. None of us, even by much thinking, can quite realise the courage and the faith of a Columbus, setting forth on untracked waters to find an unknown land. Thousands of brave lives, much thought, and wisdom, and patience, and faith have gone to the gaining of the knowledge which is expressed in a globe or in a map of the world. Those of us who stay at home, and take good care of ourselves, ought to remember this when we open an atlas.

Now, we are not going to consider here all the different colours which we see on an ordinary map of the world. Maps published in England, for instance, show much red, and we learn that red indicates the territory for which they who live in those little islands are responsible, and when we see how much of the world is so marked, we are forced to think what a solemn thing it is to be charged with such a responsibility.

There are other colours besides red, and we know that these colours stand for different countries, and the line between one colour, or country, and another is called a frontier. Now, one of the first things that we learn, when we study real knowledge, is that for science of the highest kind there are no frontiers, and that these different colours in which our maps are printed do not mean everything for anyone who tries to do the highest kind of thinking. A great man, who travelled all over the world, once said: " I have travelled all over the world, and I have found only two kinds of people, men and women." We might add that if we travel all over the world, we find only one thing everywhere, and that is Nature. The laws of motion, and of light, and of chemistry, the laws of water, and of air are true everywhere, and the earth is a whole, which we must always think of as a whole; just as mankind is a whole, and to be thought of as the child of the earth, even though we sometimes think of ourselves as a number of foolish little groups of people, hating and fighting each other.

Now, the first thing we discover is that the face of the earth is partly covered by water and is partly dry land. We know that about two-sevenths is dry land, and about five-sevenths water. The great masses of dry land we call continents, and the great masses of water we call the oceans.

THE GREAT MOUNTAIN PEAKS THAT RISE OUT OF THE SEA

There is land at the bottom of the oceans, and where this land rises high enough, as, for instance, in a sort of mountain range, we may find the peaks of the mountains coming up above the surface of the water, and forming a chain of islands. On the other hand, even in the middle of the continents, we may find deep places which are covered with water, as, for instance, in the great lakes of North America or the Caspian Sea in Asia. This distribution of land and water on the surface of the globe, we have lately learned, is constantly changing. There is no end to the evidence that proves this.

When we look at a map of the world and see the continents and the oceans, we must understand that what we are looking at is a map of the world as it happens to be now; that our lives, or the whole period of written history, are but moments in the history of the earth, just as the whole history of the earth is but a moment in the history of the universe. We are gradually beginning to find out how it might be possible to make quite a different map, showing what the face of the earth was like, perhaps a million years, or five million years, ago; and we may even begin to learn something of what the face of the earth will look like in a million years to come. It is probable that, on the whole, the surface of the earth from age to age is getting rather drier.

HOW THE EARTH IS DRYING UP AND BECOMING LIKE THE PLANET MARS

New water is being made on the earth; but more is being lost, for as a planet like the earth gets older, more and more of the water sinks through its crust, and leaves the surface. When we make a careful study of the planet Mars, which probably has yet a great deal more to teach us about our own earth than we have learnt already, we believe that Mars shows us what the earth may one day become, and probably the moon teaches us the same lesson. The whole surface of Mars is now very nearly, though not quite, dry. There is not much water upon it except at its Poles.

But though this is probably true of the earth as a whole, and though there was probably never more dry land on the earth than there is now, yet there may have been areas of dry land once, in places where now the ocean rolls; while, on the other hand, great stretches of the present continents must have been under the water. We have some evidence of a lost continent which is specially interesting because it has to do with the history of our own distant ancestors.

When we look at a map of the world, we see running down from India, through Siam and the Malay Peninsula, a great broken chain of islands which leads to Australia, the biggest island of them all. This great island is so big that it is really a continent, though, of course, it is not so big as the continent of Africa, which mankind lately made into a great island by cutting the wonderful Suez Canal.

A MIGHTY CONTINENT THAT LIES LOST AT THE BOTTOM OF THE SEA

When we study Australia and the islands which lie between it and Southern Asia, we begin to learn that very probably there was once a great continent there, and that all these islands, smaller and larger, really represent the highest parts of that lost continent. When, too, we study the kinds of life that are to be found in Australia and these islands, we are more sure than ever that they must have begun to be developed on a single great continent, and when we examine still more closely the peculiarities of the living creatures in Australia itself, we can even begin to guess about how long ago it was that Australia was made into an island and cut off from the rest of the world. Of course, as we read this, we shall keep a map of the world before us. Now, in the northern part of this vast district—as, for instance, in the islands of Sumatra and Borneo—we find some wonderful kinds of monkeys, of which we may see living specimens at the zoological gardens in cities any day. These, we can prove, are more like primitive man in form than any other living creatures in the world. So it is possible that, long ages ago, the very first of mankind lived on this lost continent, and that there mankind first saw the light.

Thus we come to the first of the great questions which face us, directly we realise that the land and water of the earth are always more or less changing places. What are the forces which lower a continent so that part of it becomes the bed of the ocean, and what are the forces that can raise the shallower part of an ocean so that it becomes a continent? There are no more important questions for this branch of knowledge, and I fear that there are scarcely any more difficult to answer.

THE MYSTERY OF THE RISING AND THE FALLING OF THE OCEAN FLOOR

If we were merely to ask what it is that is eating away, for instance, parts of the east coast of America, then there would be no difficulty, for we can see the process going on under our own eyes, and we see that wind and water account for it. But if we are to discover what happens to make the loss of a whole continent, it is evident that we require some deeper explanation than this kind of thing. Deeper is exactly the word, for it is quite evident that nothing acting on, and at, the surface of the earth could produce such tremendous results. The surface forces of wind, rain, air, and water can, after all, only affect the surface. It is quite plain that they could not possibly raise the bottom of the ocean so that it became dry land, nor push down a whole continent so that the ocean rolled over it. We must find some forces that act at a deeper level.

Now, we know quite well that if we constantly shovel rubbish into a deep space, in time we shall fill it up. It might be that the floor of the ocean was gradually heaped up with something from age to age until at last it came to the surface; and we know that the floor of the ocean does get heaped up by the remains of living creatures, and that the same matter that makes the chalk cliffs of the English Channel is being heaped up at the bottom of the Atlantic.

THE SEE-SAW OF THE EARTH'S CRUST THAT GOES ON FROM AGE TO AGE

But the average depth of the ocean is two and a half miles, and it is quite certain that it is not this process which accounts for the making of continents from the ocean floor. It is not that anything is heaped on the floor, but that the shallower part of the floor itself is raised up. Besides, if this were the explanation, it would still leave us unable to account for the other thing that happens—the sinking of the continents. The more we come to study this question, the more we see that the real explanation, whatever it be, must be one that explains both processes. Something goes on from age to age which at one place raises the level of the earth's surface, and at another place lowers it.

It is a kind of see-saw process. Water, of course, being fluid and able to run, and being pulled by the attraction of the earth, always goes as near the centre of the earth as it can; so if the level of the solid crust falls low enough at any place, the water runs there; and if, on the other hand, the level is raised, the water runs off it. Therefore, the presence of the water, which we call the ocean, simply marks the deeper places as compared with the higher places of the earth's surface. What we need to do to get a real understanding of the question is to try to get an idea of what the earth's surface would be like if all the water were taken away. Then we could understand its real shape, its ups and downs, its depths and heights.

THE CHANGES IN THE EARTH'S CRUST AND THE UNSEEN FORCES THAT CAUSE THEM

What is it that makes the deep places deep, the high places high, and that sometimes raises the first and lowers the second? This is a far better and truer way of looking at the question than we can get if we have the presence of the water always in our minds. At once we learn that what we are studying is really the shape of the solid earth and the reasons which produce that shape and change it from age to age. The second great thing we learn is that the causes of all these tremendous changes that show on the surface are at work underneath the surface. The surface means a lot to us. All life is its child. But, after all, if we could drain all the water away, we should find that the outside of the earth is merely a thin crust, probably not more than forty or forty-five miles thick at the most; and the movements of this crust up and down—which have such tremendous consequences, throwing the water outside it from one place to another, turning oceans into continents and continents into oceans—are due to the gigantic forces that are ever at work in the interior of the earth. That is what we mean when we say that we must find a deeper explanation of these surface changes. At last we have got deep enough.

WHAT WOULD HAPPEN IF THE EARTH WERE QUITE ROUND LIKE A BALL

Now, first of all as to what is the real shape of the solid earth at the present time. What would it look like if we could dry it—run all the water off it, so to speak, and hold it in our hands? For instance, would it be round, like a ball? We may be perfectly certain that it would not. If it were round, like a ball, the water would cover it equally all over; the whole surface of the earth would be one waving ocean, and life would have had to develop, as far as it could, either under the water, or floating on the surface of it. We have already learnt that life could not have advanced far on such an ocean-covered earth.

Then what is the shape of the solid earth if it is not round? Perhaps a map of the world or a globe will teach us something. When we look at such a map, almost the first thing that must strike us is that by far the greater part of the land is to the north, and that by far the greater part of the water is to the south. Now, that is very interesting and peculiar. There is no reason why we should have expected it, and probably it must mean something. There is such a thing as chance, which has its own proper laws; but the laws of chance would not account for the peculiar distribution of land and water on the earth at present, any more than they would account for the remarkable number of spiral nebulæ in the sky.

HOW THE CONTINENTS AND COUNTRIES OF THE WORLD TAPER OFF TO THE SOUTH

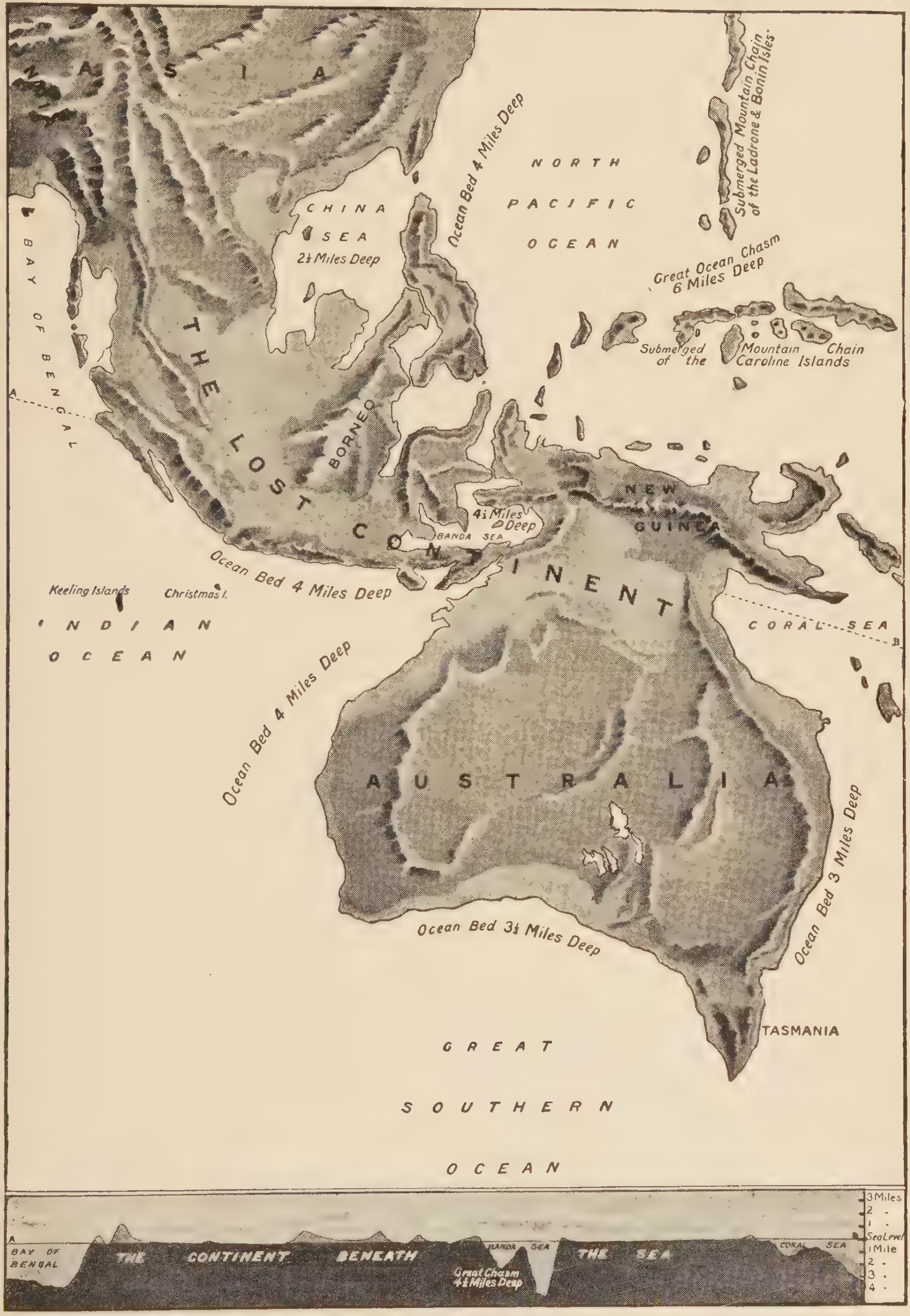
And then we notice another thing. It is that, in general, when the land does run down into the south, it gets narrower as it runs down. We see this almost everywhere. Always there is this tendency for the land to run down in tongues to the south. Look at the shape of Greenland and of South America; look at the shape of Africa; look at the shape of India; even look at the shape of Asia, and the lost continent that ends in Australia as seen in the map on page 3007. We see that it gets narrower as we go south. And if we imagine Tasmania joined to Australia, as it once was, we see that Australia itself runs southward almost to a point. Here is something which must have a meaning.

This deeply interesting and important study is now being carried on by men in different continents, and they are really as yet only in the middle of their work; but it is so important, and will certainly be so much more important, that I am quite certain we ought to understand it as far as it has gone, though we shall not find very much about it in any books in English, or in any other language. These students have made various imaginary maps and models of the earth, showing what the shape of the land would look like, and how it would be distributed, if the level of the ocean were different from what it is at present, say, a quarter of a mile deeper, and so on. They are able to do this because nowadays the bottom of the sea has been very largely mapped out over the greater part of the world, and we know where it is deep and where it is shallow, and what parts would appear above the surface if the water were drained to different levels.

THE SHAPE OF THE EARTH, WHICH IS LIKE A BIG PEAR AND NOT LIKE A BALL

All this work, which is exceedingly difficult, and has taken many years already, inclines us to the belief which we might have begun to guess at directly we saw how much water there was to the south, and how much land to the north, namely, the belief

A CONTINENT THAT HAS SUNK FROM SIGHT



If we look at a map of the world, we see a long chain of islands between Asia and Australia. It is thought that millions of years ago all this land was joined together and formed a mighty continent; but the land gradually sank and the sea rushed in, so that only the mountains remained above the water, and they now form the islands of the Pacific. If the sea were to sink only 400 yards, we should again be able to live on the lost continent, which is shown restored in this map. Very deep water surrounds the continent on all sides, as may be seen in the lower picture, which shows a section of the lost continent across the line from A to B on the map.

that the solid earth is roughly pear-shaped, with the most bulgy part inclined rather to the north, and the tapering part inclined rather to the south. We must not imagine that the pear runs exactly north and south, nor are we to think of it as at all a perfectly regular pear; but, all the same, this theory of a "pear-shaped earth" almost certainly represents a great advance in our knowledge of the earth's history, and even its future. It is not possible, except for those who have devoted years to mathematical studies, to explain the supposed causes which have produced this pear-shape. At any rate, we are to think of the great oceans as clothing this pear in such a way that, when they are added to it, it becomes a fairly regular round ball.

Working away all the time, and never to be forgotten, are the mighty forces under the earth's crust. It is these which, if we really understood them, as we have scarcely yet begun to do, would explain to us why the level of the surface heaves up and down. We could not understand this if the crust of the earth were made of the same substances everywhere, and were of the same thickness everywhere, and if the solid earth itself were perfectly round.

HOW THE EARTH'S INTERIOR SHRINKS AND THE CRUST WRINKLES INTO MOUNTAINS

Then the results of what is happening inside the earth, which is that it is shrinking, would show themselves equally everywhere. But the crust of the earth is not made of the same materials everywhere. It is probably very much thinner in some places than in others; and, being pear-shaped, the strength of gravitation is different at different places. All these reasons help us to understand why, as the interior shrinks, the earth's crust does not slowly settle down upon it in all directions, and why the crust gets wrinkled into mountains, gets cracked, tilted and twisted, crushed and stretched, and is even heaved up and down from age to age.

One of the greatest pieces of work for the future of science is to understand what is really happening inside the earth, and to find out what is really the structure and composition of the earth's crust. Until this is done, the study of geology is, after all, only a study of little things on the surface. It is as if we were to try to understand the history and the life and the movements of a human being by looking simply at the outside of him with all his clothes on.

A HOLE THAT WOULD TAKE A CENTURY TO DIG AND COST MILLIONS OF DOLLARS

It has been reckoned that in less than a century, if mankind worked very hard, and spent several hundreds of millions of dollars, we might make a hole in the earth perhaps ten miles deep. Even that is only a guess, because no one knows what we should come to before we had got half as far, or even a third as far. We might get a supply of steam, but even then we could learn very little; and to descend such a hole would be certain death.

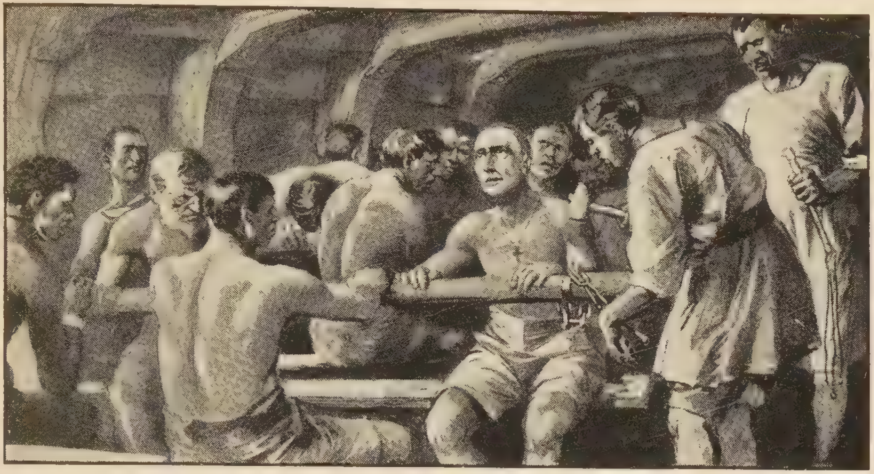
The really marvellous thing is that men of science are able to learn as much as they do within the narrow and strict conditions that confine them. It is a marvellous thing that we should know the very weight and properties of the atoms in a star that is billions of miles away, and no wise person will venture to declare that we shall never learn the great facts about the inside of our own earth. New ways of learning are open to us as the generations go on. Only within the last few years we have discovered radium and what it does. We have now detected it in the crust of the earth; we have reckoned the proportion of it, to some extent, in the various things that compose, at any rate, the outside of the crust of the earth, and we are just beginning to understand how this element, by its never-ending production of heat and electrical forces, must be at work, changing and shaping the earth's crust from age to age.

HOW THE GROUND RISES AND FALLS TWICE A DAY EVERYWHERE

Still more recently French and German scientists have declared their discovery of tides in the earth's crust. They tell us that twice every twenty-four hours the solid crust rises and falls as much as eight inches, but, of course, we do not notice this any more than sailors in a ship feel the tides of the sea.

These are the deepest and most difficult questions, though also the most important. We shall next go on to study other matters which are nearer the surface upon which we live, and which, therefore, we better understand.

The next part of this is on page 3071.



THE FRIEND OF THE SLAVES

CONTINUED FROM 2932

About three hundred years ago, at a time when the ships of those days ventured out of port in hourly dread of attack by sea-robbers, a French vessel coasting along the Gulf of Lions was seized by three African pirate corsairs. They killed the captain, and the crew and the passengers, including a young priest, Vincent de Paul, were chained and shut up in the hold.

The prisoners were cruelly treated, though many of them were suffering from wounds received in defending the vessel. Being landed at the port of Tunis, they were sold as slaves in the market-place. The young priest did all he could to encourage his fellow-prisoners. He was sold to a fisherman, and then to a Moorish physician, who took a liking to the clever youth, and promised him freedom, and a life of ease and honour, if he would turn Mohammedan. But he replied that he preferred slavery to giving up the Christian religion. Soon after that his master died, and he was sold again to a native of Venice, who had not withstood the same temptation to renounce his religion.

Now, Vincent de Paul did the work of a field labourer on his master's farm. He talked to his master's wife; and when she discovered through him what a true and beautiful religion her husband had given up, she was grieved, and persuaded him to become a Christian again.

That was a dangerous thing for him to do in a Moorish country, so the master and his slave escaped alone in a small boat to Europe.

Vincent de Paul's life was full of change, and he seems to have done kindnesses to numbers of people he met. He visited and comforted the sick in a Paris hospital, and at one time acted as tutor in the family of Count de Joigni, who had to inspect the convict ships, or galleys, as they were called, in the harbours.

The poor priest knew what it was to be a slave, and his heart was stirred to pity at the sufferings of the miserable convicts. He could not rest till he had gained permission from King Louis XIII. to do what he could to help them and to give them alms. So he became the king's almoner.

In visiting a gang of convicts at Marseilles one day, he found a poor broken-down man in chains, and despairing at the hardships his wife and children were enduring while he was unable to care for them. Many convicts were unjustly punished for quite slight offences, and ought to have been free. It is possible that this man ought to have been at liberty; at any rate, Vincent de Paul thought so; for, unable to bear the sight of the convict's misery, he made up his mind to do a very noble and unselfish act—to change places with the man. He knew the gaoler, and got permission to take the convict's place.

And so the chains were removed, as we see in the picture on page 3009, and put on the priest, who took his place in the gang of men. But he suffered so much from the rough life, hard work, association with criminals, and cruel pressure of his chains, that, though he was soon released, he felt the after-effects all his life.

Aided by his friend, the count, he won back the prisoners to hope and self-respect, and both worked hard to improve the prisons and galleys. Vincent de Paul devoted his life and his possessions to the service of the oppressed. He collected money, and with it bought and freed 1,200 slaves. He started the Order of Sisters of Charity who do so much good in France, visiting the sick and taking care of helpless children and aged people. He influenced for good the King and Queen of France. He got the king to persuade the Dey of Tunis to let him establish a mission to the Christian slaves of the Moors in North Africa. The Brothers of St. Lazarus, as the missionaries were called, arrived there in the midst of a plague, and nursed and helped both Christians and Moors.

It was many, many years before the English and French fleets succeeded in doing away with piracy in the Mediterranean; but it was largely owing to the interest in the matter roused by Vincent de Paul that the traffic in slaves was finally stopped.

THE APPRENTICE BOY AND HIS MASTER'S CHILDREN

At the time when boys were apprenticed to a tradesman to learn a business or craft, a boy was learning to be a gunsmith in a port in the West of England. He was a boy whom his master trusted, for one day he left him to take care of the house and the four little children, while he and his wife went to visit a village near by.

While the boy was busy serving customers, the children were playing together in the room behind the shop. All went well until, after one man had stayed chatting some time, the apprentice thought the childish voices had been quiet a long while. He listened, but heard only a far-away little murmur.

Then he grew rather anxious, wondering where the children could be. After calling them several times, at last there came an answer, which made him run to the top of a ladder leading down to the cellar under the shop. On shouting down the ladder, the little ones told him with glee that they were playing shops, and had lighted a candle.

That might have been a harmless game, but when the apprentice heard what was going on he was filled with horror, for down in that cellar gunpowder was stored. As fast as he could, the boy hurried down into the cellar, and there he found his fears confirmed. The dangerous powder was doing duty for tea and sugar, and being put into pieces of paper, as the children had seen done in the grocer's shop.

But that was not the worst of the play. The children had found a piece of candle-end, had pushed the cover of the barrel of gunpowder half off, and had placed the lighted candle-end upon it.

Any moment they might all be blown up. Here was opportunity for the display of presence of mind and great courage.

"Run and see if father and mother are coming!" cried the boy. "Make haste!"

He said just the right thing. The children loved their parents, and they were obedient. If they had not obeyed instantly, but had stopped to finish measuring out that dreadful sugar and tea, they would have been killed, for the candle was flaring down near its end. But they rose from the ground, clambered up the ladder, and ran out into the street.

The brave boy down below, protecting the candle-flame with his hands, listened intently till the patter of the little feet overhead had ceased. Then, with the greatest care, he lifted the guttering candle-end, and though it burnt his fingers, he carried it very slowly, very carefully to the foot of the ladder, and climbed into safety. His wonderful coolness and presence of mind had prevented a terrible calamity.

THE NEXT GOLDEN DEEDS ARE ON PAGE 3167

ITALY, THE LAND OF ROMANCE

CONTINUED FROM 2968

INTO the blue, tideless Mediterranean Sea three large peninsulas point southwards. They are the Iberian Peninsula, consisting of Spain and Portugal, very solid in shape, on the west; the Balkan Peninsula, with its very jagged coasts, on the east; and between them lies the long, narrow peninsula of Italy, in shape very much like a fisherman's boot. At the point of the toe is the island of Sicily.

The King of Italy

Let us look well at the shape and position of Italy, for they have largely influenced its story. Owing to its long, narrow shape, the various districts have always been much cut off from each other, and with its immense coast-line no part of Italy is more than seventy miles from the sea. Its central position gives it command of both the east and west basins of the great inland sea, as well as the keys of the passes in the Alps, which separate the northern part of the country from Central Europe.

Hence, in the very far past, when the "world" consisted of the countries bordering the Mediterranean and the great nations of the East in Asia, Rome, in the middle part of the middle peninsula, gradually rose to be mistress of that world. Later, all through the years when the European countries were growing into their present shapes, continual wars were waged for the possession of the country whose "gates" were so important both for trade and for conquest.

We read on page 2962 of these passes over the Alps, and of the wonderful tunnels that have been recently made right through the mountain masses, by which trains now pass rapidly from France and Switzerland into Italy. Wonderful and interesting as it is to rush through these long tunnels, the more beautiful way to enter Italy is the old way over the passes, which people often do now by motor-car. It is a steep climb out of Switzerland, by zigzag roads, ever up and up, and in and out through beautiful valleys, by the slopes of great hills, with their forests and waterfalls.

Then comes the region of snow and ice, and at the top of the pass a pause must be made to enjoy the view of the mountains sloping down to the vast level plain beneath, whose green pastures and woods, watered by the River Po and its tributaries, melt into the blue haze of the far distance. Descending into Italy, the snow and rocky heights are left behind, and the travellers pass into a soft, warm air and a smiling, sunny country, where bright flowers make gay with colour the little white villages and fine villas, and fruitful vines grow twined round mulberry trees, and luxuriant orange and lemon groves give out their sweet, faint scent.

We can see from the map how the great sheltering Alpine range circles round this wide north plain of Italy from Austria to France. The high land then becomes the chain of the Apennines, which bound the south of the plain, separating it from the Gulf of Genoa, and then, turning southwards, run throughout the entire length of the peninsula for some 800 miles, and end in the wonderful volcano, Mount Etna, in Sicily.

The green, round-topped Apennines are little more than half the height of the Alps, and on them grow pines and chestnuts ; flocks and herds feed on the pastures, and in the fields grow all kinds of crops. The position of the range, more or less near the middle of the long peninsula, gives but little room for the course of the rivers. Most of them run down straight to the sea, but in the western plain, where the mountains lie near the east coast, there are two famous rivers, rather longer than the others, the Tiber and the Arno.

THREE FAMOUS RIVERS ON WHOSE BANKS STAND MANY SPLENDID CITIES

The Tiber is about 50 miles shorter than the Hudson. On it stands Rome, so old and so grand that it is called the "Eternal City." On the Arno stands beautiful Florence—the city of flowers—of whose glories we read on page 2779. It is only in the north continental part of Italy, in the wide plain encircled by the Alps and Apennines, that there is room for a long river such as the Po to travel its 450 miles from its source, on the borders of France, to its mouth, in the Adriatic Sea. There are many splendid towns in the basin of the Po, and it has always been a fertile and flourishing district, except when ruined by cruel wars ; for, in addition to its warm climate, it is well watered and served by its large river, navigable for 200 miles, and its many tributaries. Steamers pass to-day from the sea to the beautiful lakes of Maggiore and Como, which, with many others, nestle round the feet of the giant Alps. Poets and painters delight in the wonderful scenery of these lakes, which attract thousands of visitors every spring, when east winds are raging in North Europe, and summer seems very far off. But summer comes early south of the Alps, and it is indeed a joy to go in a boat on the blue lakes and look up at the crags and white peaks, or follow the winding roads among the woods at their edges, or sit still in a lovely garden overlooking all this beauty, softened, as it often is, by a dreamy golden haze.

A PROSPEROUS AND UNITED KINGDOM NOT YET FIFTY YEARS OLD

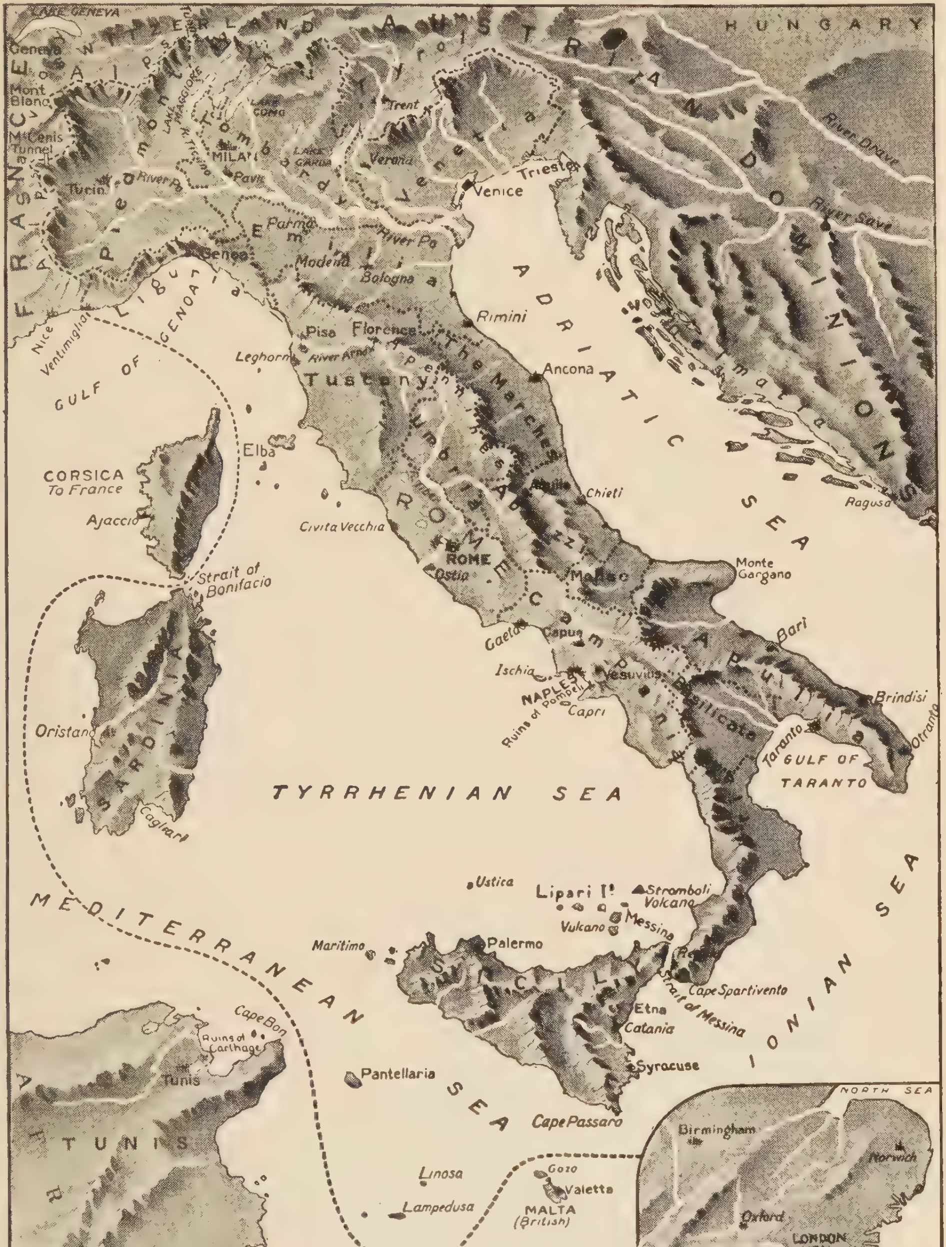
To-day, this country of the great north plain, and the long peninsula, with its backbone of mountains, together with the islands of Sicily and Sardinia, form one united kingdom, about twice the size of the State of Florida, and the city of Rome is its capital. The real beginnings of Rome lie more than 2,500 years back, and we read of the old Roman Empire in another part of this book, but the united kingdom of Italy to-day is not yet fifty years old. As we study the map of Italy, we notice that there are various provinces, such as Lombardy, with Piedmont and Venetia each side of it, in the north ; Tuscany, Campania, Calabria, and several others in the peninsula itself. These are the survivals of the many different states which existed in the past, sometimes independent, sometimes crushed under neighbours or foreigners, but never really united under one ruler from the days of the grand old Roman Empire until 1870.

We remember in the story of Great Britain, told on page 198, how hurriedly and urgently the Roman soldiers were called home from the walls and camps of Britain to defend not only Italy, but the great heart of the empire, Rome itself, against the wild hordes who were then streaming down the peninsula. These Goths entered the splendid city, and did so much damage to it that to this day we speak of a rough person, who does not understand or care for beautiful things, as a Goth.

HOW THE FIERCE GERMAN TRIBES SWEPT THROUGH THE WHOLE LENGTH OF ITALY

Before this calamity, the empire had been divided into two branches, Rome remaining the capital of the Western emperor, Constantinople, or Byzantium, becoming the capital of the Eastern emperor. Presently the line of Western emperors came to an end, and the Eastern emperor appointed an officer to rule for him over the West. And so the old empire became less and less able to resist the wild enemies that poured in on the unhappy country.

ITALY, THE LAND OF SUNSHINE AND SNOW



In a map, Italy has the curious appearance of a man's leg and foot about to kick Sicily through the Straits of Gibraltar into the Atlantic Ocean. The country is very mountainous, for right down the middle run the snow-clad Apennines, and in the north the towering Alps act as a protecting barrier from invaders. Hannibal and Napoleon, however, found the Alps no bar to their conquering progress. When Austria ruled in Italy, an Austrian statesman said that Italy was merely "a geographical expression," meaning that this country united under one sovereign and one government was unthinkable. But half a century later the apparently impossible was realised, and Italy is now one country not only geographically, as we see here, but one in thought and action.

There were the Lombards, a German or Teutonic tribe, ever pressing southwards from the Elbe to the Danube, and thence into the rich north plain of Italy, which is called after them to this day. One of their victorious kings marched right down the country to the very point of the toe of the "boot," and, touching with his lance a column on the seashore, said, "Thus far shall stretch the bounds of the Lombard kingdom."

THE POWER OF THE ANCIENT EMPIRE WANES AND THE POPES GROW STRONGER

But he was mistaken; the Lombard kingdom lay chiefly in the basin of the Po. The wisdom and noble-mindedness of the Bishop of Rome of those days—he was the sixty-fourth since St. Peter—kept the Lombards in check for a time. This was Gregory the Great, the man who had felt such pity for the beautiful Angle children, desolate in the slave market, where they were exhibited. He accustomed the people to the idea that the head of the Church could also look after the affairs of State, and so it came to pass that, as the old power of the ancient empire flickered out, the new power of the Bishops of Rome began to grow.

We have seen, on page 2524, the popes who succeeded Gregory calling in the help of the Franks against the Lombards, and this led to Charlemagne, their king, being crowned Emperor of the Holy Roman Empire by the pope. It was a kind of revival of the title that was dead and gone, but the power was never the same as of old.

In the centuries after Charlemagne many foes descended on the long, narrow peninsula, which received but little help from the shadowy emperors, who lived chiefly across the Alps.

HOW THE EASTERN TRIBES AND NORMAN SEA-ROVERS OVERRAN THE SOUTH

There were the Mohammedan Saracens, or Arabs, who overran the southern lands and the beautiful island of Sicily, and plundered the rich cities they found there. The Magyars, or Hungarians, made many inroads on the north before they were driven back and made to settle round about the Danube.

Then, about the time when Duke William of Normandy was planning the conquest of England, Hasting, another Norman leader, brought his bands to South Italy and Sicily, and they won nearly all the lands that still owned the sway of the old Eastern emperor. To this day the beautiful round-arched Norman churches, like those in the north of France and in England, speak of the presence of these daring sea-rovers in the far Sunny South.

There was little peace in those days. The various states of Italy were generally at war, and bent on seizing each other's dominions, and they cared less and less to have a German emperor over them. The tie was a very loose one, though occasionally there was a grand coronation at Rome, and the stronger emperors, such as Barbarossa, now and then came over the Alps with German soldiers to ravage and kill their Italian subjects. But the power of the Church, from its head to the lowest of its clergy, went on steadily increasing. Great possessions were left to the popes, so that in time they ruled over a large tract of country, the Papal States, or States of the Church, and large estates everywhere fell to the bishops and abbots. Then, as the clergy were better educated than most of the people, and more fitted for public business, by degrees they filled all the chief offices of State.

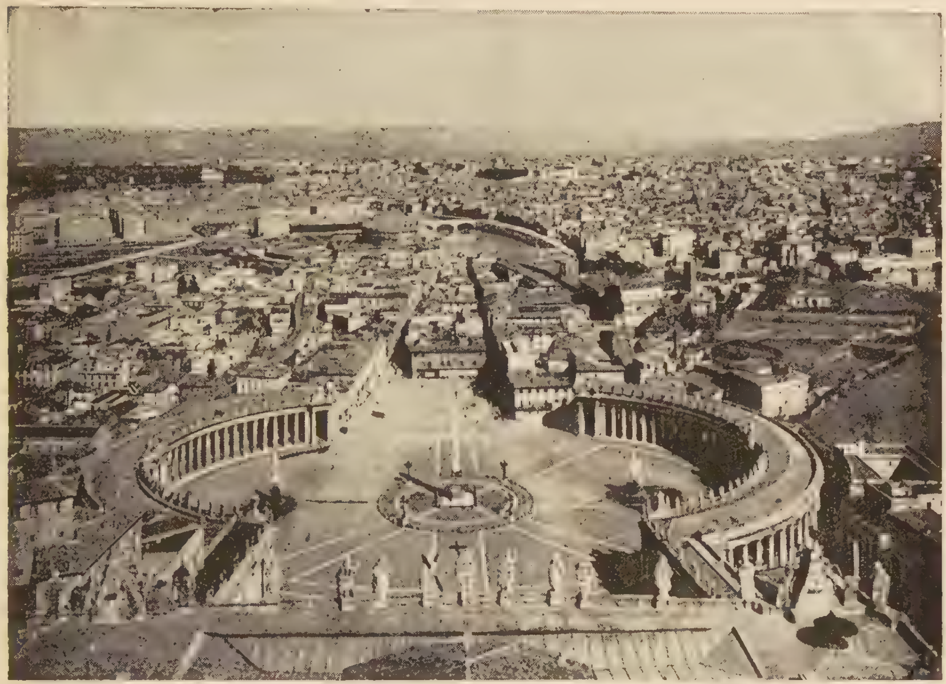
THE RISE OF THE GREAT TRADING CITIES AND WHAT THEY DID FOR ITALY

We have seen in the history of Germany how soon the popes and emperors began to disagree. There was Henry IV. at Canossa, of whose submission we read on page 2526, and Barbarossa at Venice; indeed, for centuries the chief part of the history of the times is the account of the quarrels between the two heads of Christendom.

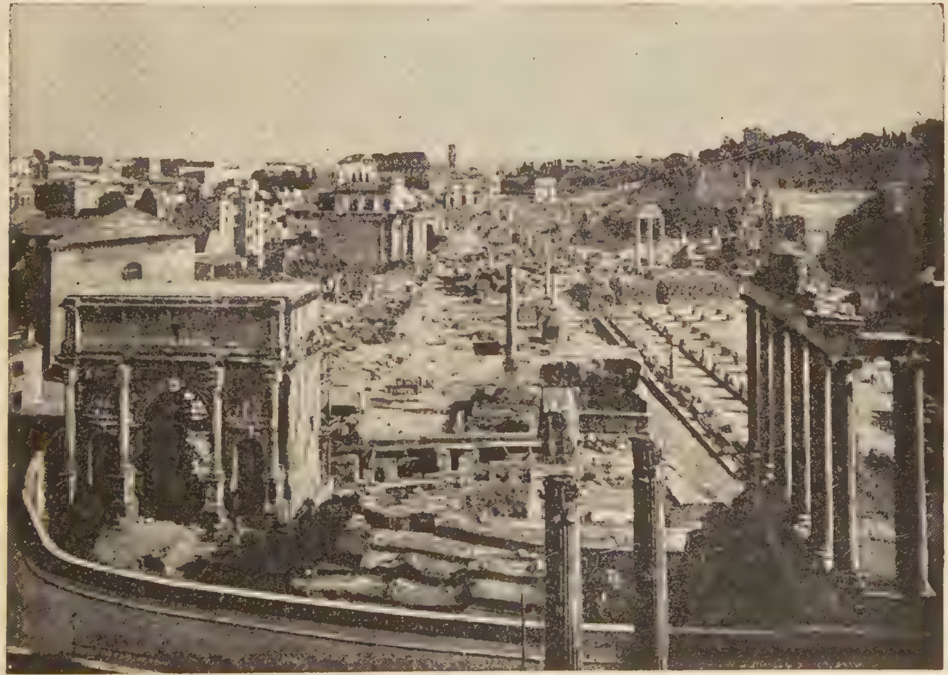
From the tenth century onwards the great cities of Italy played a large share in its story. When so many wars and disputes were going on, it was necessary to fortify and hold them against one side or the other, and often they managed to get privileges given or confirmed as a price for their help, till at last they became practically free, and governed themselves. They became, too, very rich from trade as the years went on, and splendid cathedrals rose up, as well as magnificent palaces and houses, all filled with the works of art that have made Italy so famous.

Let us turn now to the chief of these old towns, to read in them the many-sided story of the Middle Ages in Italy.

ROME OF TO-DAY AND ROME OF THE PAST



Even in ancient times, Rome, the city built on seven hills, was known as the Eternal City. As the centre of the mighty Roman Empire, she was for centuries the mistress of the world; and though that empire fell, the Rome of the popes went on ruling the nations. Now, however, she is simply the capital of Italy, and the spiritual centre of the Roman Catholic Church. Here we have a panorama of the city as seen from the dome of St. Peter's.



Of all the magnificent architecture that adorned the Rome of the Cæsars, little remains to-day but the ruined Forum, seen here. The Forum was the centre of Rome. Here, with temples and tokens of triumph all around, the people of the world-conquering nation used to meet and declare their will. Now the scene, as shown in this picture, is a mass of ruins, buried for centuries and now revealed, fitting emblem of a departed empire.

We will start in the Plain of Lombardy with Milan, connected by canals with the River Po and Lake Maggiore. Here the Lombard kingdom was overthrown by Charlemagne, and Barbarossa three centuries later utterly destroyed it. But it rose again, and early in the fifteenth century was built the beautiful cathedral, of which we see a picture on page **619**.

THE DAZZLING WHITE BEAUTY OF ONE OF THE WONDERS OF THE WORLD

One can well believe that the snowy pinnacles of the frozen Alps inspired the architect with the idea of this wonder of the world in white marble, with its slender shafts and sharp spires gleaming in the rich sunshine. Two thousand statues and the richest sculpture cover it from pavement to tower, and the dazzling white beauty of the whole reminds one of a glorious piece of frost work. Old palaces and monuments tell of the taste and power of the princely families who kept brilliant courts at Milan at the time of its greatest fame. In the sixteenth century Milan and the country round fell to Philip II. of Spain, the husband of Mary Tudor. During Marlborough's wars it passed to the House of Austria, who kept it till the middle of last century, except for the few years influenced by Napoleon.

On the way to Genoa we pass Pavia, the old capital of the Lombards, situated where the River Ticino falls into the River Po. In a very old church here, Barbarossa and other German sovereigns of the Middle Ages were crowned with the famous old Lombardy crown, in which is an iron fillet said to be made from one of the nails of the Cross.

THE BOLD SAILORS OF GENOA WHO DEFIED A FRENCH KING

Genoa lies on the sunny slopes rising from the Mediterranean. It had a long and eventful history before the time of the Crusades, when a busy trade arose with the eastern part of the Mediterranean—the Levant. Its merchants became very rich, and a beautiful cathedral, with the front of black and white marble, was built, as well as many other churches and fine palaces. The Genoese were brave and daring sailors, and many settlements were made by them round distant parts of the Mediterranean. They had many struggles with Venice, which sorely defeated them at the end of the fourteenth century. The famous Christopher Columbus was born at Genoa, and many other seamen of the town found their way out of the narrow Straits of Gibraltar to the opening-out world of the South and West. For many years the city was torn in two by the quarrels of the great families who ruled it, and the Turks finally conquered its Eastern possessions as its power went down. But there was still a bold spirit left in the Genoese. When Louis XIV. commanded their alliance they refused, and did not submit till their fine city had been cruelly bombarded. A century later, Napoleon first formed it, with the land round it, into the Ligurian Republic, and then annexed it to France, after which it was joined to the kingdom of Sardinia.

Its great rival, Venice, lies on 117 small islands in a shallow bay on the north of the Adriatic. Its first inhabitants had fled to this retreat to be out of the way of the savage invaders who swept into the fruitful north plain. They became sailors and traders, and their city and territory grew rapidly, for, owing to its position, it became a depot for trade between East and West.

VENICE, THE WONDERFUL FAIRY CITY THAT RISES FROM THE SEA

No labour has been too hard for the Venetians; they drove strong piles into the muddy islands, and when the foundation was strong enough they built on it houses, and, as time went on, palaces of stone and marble, enriched by sculpture and work in mosaic, such as we see on page 1990, and stored with paintings and treasures of every kind brought home by their ships from the East. There are now nearly 400 bridges over the 150 canals which form the "streets" of this marvellous city. Boats are its carriages, for the water washes the very doorsteps of its houses.

Standing in a large square, or piazza, before St. Mark's, there is a fine view of this cathedral, of which there is a picture on page 619. It has no towers, no spires, but, after a fashion borrowed from the East, is crowned with domes. There are hundreds of marble columns and splendid statues, and over the chief portico rear four fine gilded bronze horses, brought to Venice by one of the Doges about the time King John of England was struggling with his barons

VENICE, THE FAIRY CITY OF THE SEA

VENICE, THE QUEEN OF THE ADRIATIC, AS PAINTED BY THE GREAT ENGLISH ARTIST, TURNER

A REGATTA ON THE GRAND CANAL AT VENICE, FROM A PAINTING BY TURNER

THE GRAND CANAL, WITH THE CHURCH OF SAN GIORGIO MAGGIORE ON THE LEFT

Venice is one of the most wonderful cities in the world. Its splendid palaces and churches rise up among the salt waters of the great lagoons near the Adriatic Sea like a picture of fairyland. Its canals are busy with gondolas, its queer little streets crowded with people; its domes and towers shine and glisten in the glorious sun against a sky of radiant blue. This was just the place for fairy stories to come from, and here, four hundred years ago, many of the favourite fairy tales were first written and printed.

The photographs on these pages are by Messrs. Russell & Sons, Underwood & Underwood, London, Hanfstaengl, Mansell, Anderson, & Alinari.

and the pope. These fine horses have a wonderful story. They were made by an unknown artist in Greece, and were taken to Rome, where they crowned the triumphal arches of two emperors; they were taken from Rome by Constantine, to his new capital, Constantinople; they were brought back to Italy by a Doge of Venice; they were carried away to Paris by Napoleon, and afterwards given back to Italy. These horses have thus adorned four of the world's greatest cities, and to-day they add glory to one of its most glorious buildings. The inside of St. Mark's is even more wonderful than the outside, with the gold mosaic of the domed roof and the many-coloured marbles of the floor and walls.

THE EVIL DAYS THAT CAME TO VENICE, AND THE FAME OF BOLOGNA

The Palace of the Doges is close by, and one likes to imagine the glorious processions as the Great Duke or Doge, head of the Republic, wended his way in state to the cathedral, or to his magnificent barge when he went each year to drop a precious ring into the ocean, to show the close union between Venice, the Queen of the Adriatic, and the sea, to which she owed her safety and her riches.

But evil days came to beautiful Venice as well as to the rest of the Italian cities. It passed the height of its glory after its bitter war with Genoa, when its fleets commanded the Mediterranean. The Turks were for a long time cruel enemies, and the discovery of the sea routes to India lessened its trade. For many years, too, there were great conflicts to be faced with Austria, Spain, and France. In the struggles between France and Austria, in Napoleon's time, Venice was seized and given to Austria. It was fifty years before it regained freedom, and in 1848 it once more became a republic.

On our way from Venice to Florence we pass many interesting old cities, famous for their cathedrals and universities, and other relics of the past.

FLORENCE, THE WONDER CITY OF THE MIDDLE AGES

Amongst them is Bologna, a very old and rich town. Students from every part of Europe flocked to its famous university as far back as the times of the Norman Conquest. Long quarrels between the nobles who ruled the city were at last ended by the popes adding it to the States of the Church. Florence lies among the spurs of the Apennines by the River Arno, on the great route from Upper Italy to Rome. Vineyards and orchards and cornfields surround it in peace now; long ago, both streets and countryside echoed with the shouts and cries of battle, when the great rival families of the Guelphs and the Ghibellines struggled to be first. In the midst of the din, full three hundred years before Shakespeare lived in England, another great world poet, Dante, lived and wrote in Florence. At last the merchants, so successful in industries such as wool, silk, and fur, put an end to the ceaseless conflicts by taking the government in hand. A time of prosperity then set in, during which Florence was looked upon as the money market of Europe. A great family called the Medici had immense influence not only in Florence and Rome, but in Europe beyond. They were clever, and did not mind what means they used to get their ends, but their rule promoted progress.

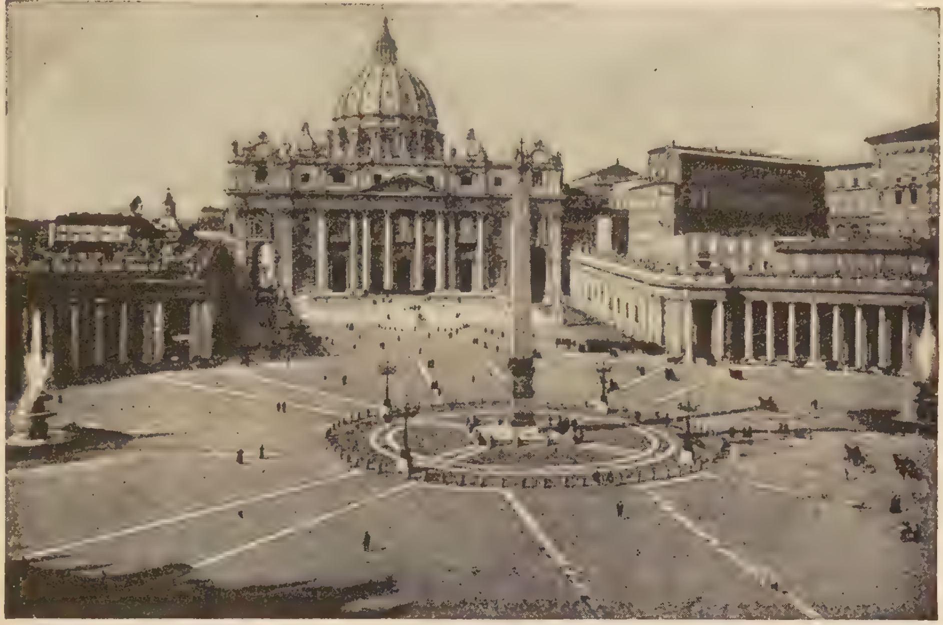
Florence is one of the most wonderful places for art in the whole world, and we read about the great men who made it so on page 2779. The Medici kept their power till Tuscany passed under the power of Austria near the middle of the eighteenth century.

ROME, THE ETERNAL CITY, AND THE GREAT CHURCH OF ST. PETER

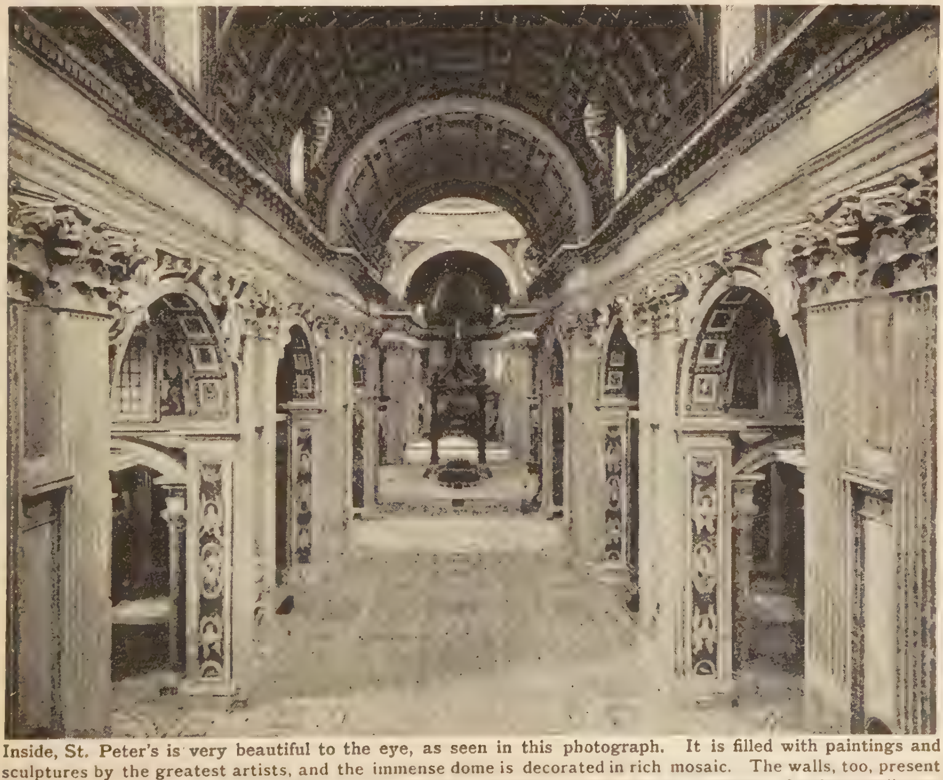
A near neighbour of Florence, and also on the Arno, is Pisa, famed for its leaning bell-tower, of which there is a picture on page 305. It has stood over 800 years, a vast, hollow pillar nearly as high as Bunker Hill Monument in Boston. It has been well said that "It looks like some fairy tower, composed of tier upon tier of marble columns and delicate tracery, and leans gently forward as though weary of the burden of its own beauty."

But "all roads lead to Rome," and from all Christendom thousands of pilgrims have made their toilsome way to visit the spots believed to be hallowed by the presence of the Apostles St. Peter and St. Paul. The greatest Christian church in the world stands on what is said to be the site of St. Peter's tomb. Over 150 years were spent in the building, and two of the most famous artists ever known—Raphael and

THE LARGEST CHURCH IN THE WORLD



St. Peter's Cathedral at Rome is so large that most cathedrals could be placed inside it, and there would still be a great deal of room. The foundation stone was laid in 1506, but the building was not finished until 1667, and among the many architects were such famous artists as Raphael and Michael Angelo. As a specimen of architecture, however, St. Peter's has been spoilt by so many different men mixing up different ideas.



Inside, St. Peter's is very beautiful to the eye, as seen in this photograph. It is filled with paintings and sculptures by the greatest artists, and the immense dome is decorated in rich mosaic. The walls, too, present the appearance of being faced with different coloured marbles; but this is only a pretence, for these walls are really covered with plaster painted to look like marble. A splendid altar of brass stands beneath the dome.

Michael Angelo—helped with their designs. A mighty flood of light pours down on the marble floor of the immense building, showing up the fine statues, tombs, and pictures for which it is so famous. The foundation of this St. Peter's of to-day was laid when Henry VIII., whose action parted England from Rome, was a young man, early in the sixteenth century. It took the place of the church which had lasted 1,000 years, and had seen the coronation of Charlemagne and many stately ceremonials of the earlier popes, all through the years when so many English bishops had to journey to Rome to receive the tokens of their office.

The Vatican Palace close by has been used by the popes since the days when the Papal Court returned from Avignon, where it was kept in exile for seventy years. This was at the end of the fourteenth century. The palace now contains about 1,000 halls, chapels, and rooms, and the greater part of it is used to house the splendid collections of books and works of art that have been gathered together by the popes.

THE RUIN WROUGHT BY THE WARS, & THE PILLAGE OF ROME BY FOREIGN TROOPS

They were troublous times for Rome while the popes were away at Avignon, in France; great families, as in other cities, struggled for power; there was constant fighting in the streets, and at last the people were stirred up by Rienzi to try to restore ancient liberties. But he was slain in a tumult. Even worse days were in store when Francis I. and Charles V. were fighting all over Italy. The extravagance and ambitions of some of the popes had almost ruined their states, and at last the army acting for Charles V. arrived before Rome and stormed it. The pope escaped from the Vatican to the strong fortress of St. Angelo, one of the splendid remains of the old Roman Empire, and for seven months the soldiers worked their wicked will in the old capital of the world. Pictures and statues beyond price were destroyed, books burned, and the inhabitants treated with the greatest cruelty. This barbarism, however, aroused Francis I. and Henry VIII., and they made Charles withdraw the soldiers.

Three years later, however, Charles, who had made peace with the pope, was crowned by him at Bologna.

Another despoiling of Rome took place when Napoleon Bonaparte, a man of Italian blood and name, pursued his career of conquests down the long peninsula. He made the pope give up part of his land and pay tribute, and send to Paris some of the most precious treasures of the Vatican. Throughout Italy Napoleon turned states and rulers about as he chose, forming republics, and duchies, and kingdoms in turn. At this time the bronze horses of St. Mark's, Venice, made a long journey to Paris, and when the pope dared to complain of his treatment, Napoleon carried him off also, a prisoner to Paris.

THE KINGDOM OF NAPLES AND SICILY, AND THE TERROR SPREAD BY BRIGANDS

Napoleon did not stop at Rome. Naples, the most beautifully situated city in Italy, and capital of the southern lands, had its full share of changes and French rulers. Perhaps of all the divisions of Italy, the changes in the south through the centuries have been the greatest and most bewildering. When the line of Norman kings ended, the German emperors had full sway for a time. Then princes of the House of Anjou were followed by Spanish rulers, then Naples fell to the Austrian Hapsburgs, and then again to another French family. Many and grievous were the wars and revolts, oppressions and hardships, so that the kingdom of Naples and Sicily had no chance of making progress like the rest of Italy, and the people were kept very poor and ignorant, and in many parts, especially in Sicily, wild and fierce brigands roamed about, making life unbearable in this most lovely part of the world, where the blue, shining sea ripples and washes round the shores of lovely rocky bays.

THE ISLAND THAT GAVE MODERN ITALY ITS FIRST KING

The island of Sardinia, lying in the middle of the western basin of the Mediterranean, was attacked in turn by Goths and Saracens, the Eastern emperors, and the popes. Later, it fell to the rulers of Savoy and Piedmont, and their united states were called the kingdom of Sardinia. This kingdom gave modern united Italy its first king.

After the fall of Napoleon, the Congress of Vienna set many of the Italian princes back in their states, and Austria was the chief gainer. So things went on

ITALY'S GREAT STRUGGLE FOR UNITY

With their country split up into many badly governed states, the people of Italy longed to be a united nation. All agreed that the first step was to drive the Austrians out of Italy, and several unsuccessful attempts were made to do this; but in 1859 Sardinia, with the help of France, defeated the Austrians at Palestro, as shown here.

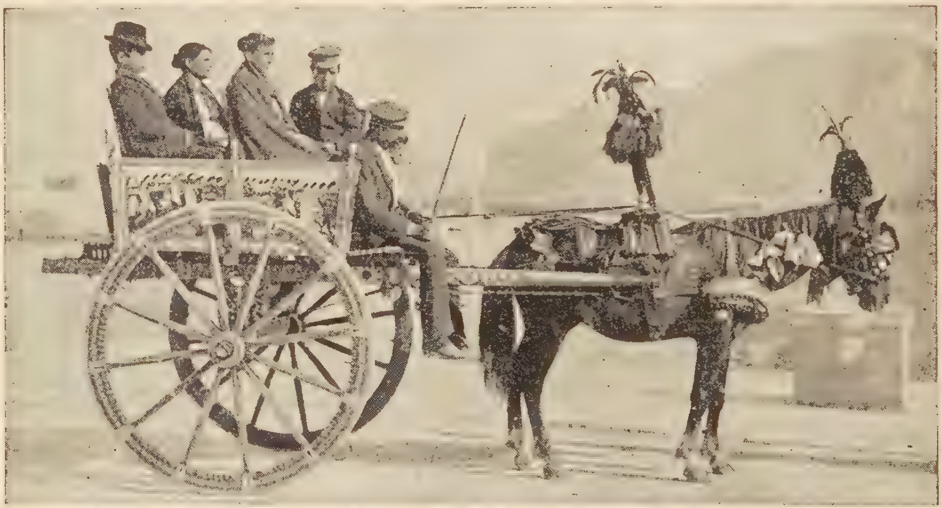
Four days after the battle of Palestro, the Austrians were again severely beaten at Magenta by the French, and the Emperor Napoleon III., with the King of Sardinia by his side, made a triumphal entry into Milan.

The success of Sardinia roused intense enthusiasm all over Italy, and the demand for unity became universal. The Austrians again suffered terrible defeat at Solferino, and Napoleon was acclaimed victor on the battlefield, as shown here. But he became jealous of Sardinia, made peace with Austria, and later fought to prevent the Italians taking Rome. It was not till 1870 that Italy really became one country, with Rome as its capital.

EVERYDAY SCENES IN SUNNY ITALY

For centuries Carrara has been world-famed for its wonderful marble, tons of which are here awaiting despatch.

Cattle drag the marble from the great quarries to the railway. The world's finest statues are of Carrara marble.



Sicily, the great island that lies at the toe of Italy, has had a famous history. But its people now are poor and uneducated. They have quaint customs, one of which is to decorate their carts with paintings, as shown here.

Macaroni, which is made largely at Naples, consists of flour and water. It is made by machinery, and while still wet is hung in the streets to dry, as seen here.

In Naples the poor people, who live in vile districts, are called the lazzaroni, after Lazarus, the poor man in the Gospel. This is a typical scene in the district.

Two upper and two lower photographs copyrighted by Underwood & Underwood, N. Y.

BEAUTIFUL NAPLES AND BUSY GENOA

No city is more picturesquely situated than Naples, standing as it does by the blue waters of the Mediterranean, with the threatening crater of Vesuvius frowning down upon it, and belching out clouds of smoke from time to time, as though warning the people of the fate of Pompeii, close by. But Naples is not only beautiful; it is a great centre of trade, an important naval and military station, and the largest city of modern Italy.

Viewed from the sea, Genoa seems to merit its name of "Genoa the Superb." But a closer view does not confirm the first impression, for the city is not really beautiful. Although it has some fine churches and palaces, the city is built awkwardly, and consists of narrow, irregular streets. It is, however, the greatest commercial seaport in Italy, and does a large trade. Genoa will always be famous as the birthplace of Christopher Columbus.

for a time much as before the turmoil and upheaval. But there was a difference. The desire that all the different states of Italy should be formed into one free Italian nation, governed by an Italian king, was now beginning to grow in different parts of the country, especially in Piedmont, one of the Sardinian states. But all conspiracies and insurrections were kept down by Austria and the princes supported by that Power.

THE MAKERS OF MODERN ITALY AND THE PEOPLE'S STRUGGLE FOR FREEDOM

One of the early leaders of the people seeking for liberty was the patriot Mazzini, and one of the great things he accomplished was that he made his countrymen believe that the freedom and unity of Italy were possible. In the revolutionary year of 1848 most parts of Italy rose. Rome and Venice became commonwealths; Milan rose against Austria; but success was not yet. The Austrians and French put down freedom everywhere. More than ten years of hard effort were needed before the King of Sardinia could be called King of Italy; then, in 1866, when Austria was at war with Prussia, Austria had to give up Venetia—she had lost Lombardy some years before. The French kept troops in Rome until the troubled time of their war with Prussia, when they could no longer be spared.

Then Rome, too, was taken, and became at last the capital of Italy. Among the great names in this wonderful struggle for freedom, besides that of Mazzini, are those of Garibaldi, the brave and daring leader who raised troops and worked early and late to free his country; the king, Victor Emmanuel, who earned the title of "the honest king" because he steadily kept his word to all the parties; and his Minister, Cavour, whose wise counsels helped to settle all difficulties with the countries of Europe. The story of the freeing of Italy is one of the most thrilling that can be written.

VICTOR EMMANUEL IS DECLARED KING OVER A UNITED NATION

We read how the pope fled in disguise from Rome on the box of a carriage; how the citizens of Venice took shelter round St. Mark's against the Austrian cannons; how Louis Napoleon helped and hindered, and took Savoy and Nice for his pay; how Garibaldi freed Naples and Sicily from the tyrant who bombarded Messina and Palermo, and who caused his own people to be shot down in the streets. When King Victor Emmanuel entered Rome in state on July 2, 1871, he received an enthusiastic welcome; but the pope shut himself up in the Vatican quarter, and refused to acknowledge the kingdom of Italy. Ever since that time the pope has shut himself up and refused to leave his "prison," as he calls the palace now.

Italy has steadily made great progress since the union. There are now in it over thirty-three millions of people, who have an increasing share in the government; education is improving; also trade and industries, as roads have been developed, and railways and telegraphs connect the most distant parts with each other and Europe beyond. Many parts of the country have been drained, and so made both profitable and healthy. In the great cities there are new streets and squares, and a new sense of order, and quiet, and responsibility, only possible when a country is free.

THE RETURN OF PROSPERITY TO THE FAMOUS OLD CITIES OF ITALY

So now Milan, "The Grand," to-day is also the chief railway centre of the northern plain, and the wealthiest manufacturing town in Italy, chiefly making silk, woollen, and cotton goods.

Genoa, "The Superb," is now the Liverpool of Italy, with great docks, and shipping. Goods are sent thence *via* Turin by the Mont Cenis Tunnel, or through the St. Gothard *via* Milan.

Venice, "throned on her hundred isles," is also a busy port, with shipbuilding yards and manufactures.

Florence, "The Beautiful," has become an industrial centre, making silk and jewellery; and Leghorn, its port, trades in corn, wine, and olive oil.

Picturesque Naples, now the largest city in Italy, is a centre for trade, and also the chief naval and military station, for Italy has rapidly developed one of the finest navies in Europe, to protect not only her own long sea-coast, but her growing colonies on the east of Africa.

Rome itself, the "Eternal City," has more than doubled its population during the last thirty years, and a great modern town has grown up beside the ruins of the "grandeur that was Rome," and the wonders of the Middle Ages.

The next story of Countries is on 3149.

AN AMERICAN GIRL'S FAMOUS POEM

EVERY boy and girl is familiar with some lines of this poem. It describes, with great dramatic effect, how a young Englishwoman sought to save her sweetheart, by preventing the curfew bell from tolling, that being the signal for his death. The curfew, or evening bell, originated after the Norman Conquest, and was first intended as a warning to the Saxon peasantry to put lights out in their houses. "Curfew" comes from two French words, "couvre feu," meaning "cover the fire." This poem has so long been one of the most popular dramatic pieces in the English language, that it may be a surprise to many to know its writer is still alive, and likely, we hope, to live for many years. Her name is Rose Hartwick Thorpe, and she was born in the State of Indiana, July 18, 1850. She wrote the poem when little more than a schoolgirl, and it would not be wrong to describe it as a schoolgirl's masterpiece. It is usually known as "Curfew Must Not Ring To-night."

THE CURFEW BELL

CONTINUED FROM 2922

England's sun was slowly setting o'er the hill-tops far away,
Filling all the land with beauty at the close of one sad day;
And its last rays kissed the forehead of a man and maiden fair,
He with steps so slow and weary, she with sunny floating hair;
He with bowed head, sad and thoughtful; she, with lips all cold and white,
Struggled to keep back the murmur: "Curfew must not ring to-night!"

"Sexton," Bessie's white lips faltered, pointing to the prison old,
With its walls so tall and gloomy, moss-grown walls, dark, damp, and cold,
"I've a lover in that prison, doomed this very night to die
At the ringing of the curfew, and no earthly help is nigh.
Cromwell will not come till sunset." And her lips grew strangely white
As she spoke in husky whispers: "Curfew must not ring to-night!"

"Bessie," calmly spoke the sexton (every word pierced her young heart
Like a gleaming death-winged arrow, like a deadly poisoned dart),
"Long, long years I've rung the curfew from that gloomy shadowed tower;
Every evening, just at sunset, it has tolled the twilight hour.
I have done my duty ever, tried to do it just and right;
Now I'm old, I will not miss it. Curfew bell must ring to-night!"

Wild her eyes and pale her features, stern and white her thoughtful brow;
And within her heart's deep centre Bessie made a solemn vow.
She had listened while the judges read, without a tear or sigh:
"At the ringing of the curfew Basil Underwood must die."
And her breath came fast and faster, and her eyes grew large and bright;
One low murmur, faintly spoken: "Curfew must not ring to-night!"

She with quick step bounded forward, sprang within the old church door;
Left the old man coming slowly, paths he'd trod so oft before.
Not one moment paused the maiden, but, with cheek and brow aglow,
Staggered up the gloomy tower, where the bell swung to and fro;
Then she climbed the slimy ladder, on which fell no ray of light,
Upward still, her pale lips saying: "Curfew shall not ring to-night!"

She has reached the topmost ladder; o'er her hangs the great, dark bell;
Awful is the gloom beneath her, like the pathway down to hell.
See! the ponderous tongue is swinging; 'tis the hour of curfew now,
And the sight has chilled her bosom, stopped her breath, and paled her brow.
Shall she let it ring? No, never! Her eyes flash with sudden light,
As she springs, and grasps it firmly: "Curfew shall not ring to-night!"

Out she swung—far out. The city seemed a speck of light below,
There 'twixt heaven and earth suspended, as the bell swung to and fro.
And the sexton at the bell-rope, old and deaf, heard not the bell,
Sadly thought that twilight curfew rang young Basil's funeral knell.
Still the maiden, clinging firmly, quivering lip and fair face white,
Stilled her frightened heart's wild beating: "Curfew shall not ring to-night!"

It was o'er; the bell ceased swaying; and the maiden stepped once more
Firmly on the damp old ladder, where, for hundred years before,
Human foot had not been planted; but the brave deed she had done
Should be told long ages after. As the rays of setting sun
Light the sky with golden beauty, aged sires, with heads of white,
Tell the children why the curfew did not ring that one sad night.

O'er the distant hills comes Cromwell. Bessie sees him; and her brow
Lately white with sickening horror, has no anxious traces now.
At his feet she tells her story, shows her hands all bruised and torn;
And her sweet young face, still haggard with the anguish it had worn,
Touched his heart with sudden pity, lit his eyes with misty light.
"Go! Your lover lives!" cried Cromwell. "Curfew shall not ring to-night!"

Wide they flung the massive portals, led the prisoner forth to die,
All his bright young life before him. 'Neath the darkening English sky
Bessie came, with flying footsteps, eyes aglow with love-light sweet;
Kneeling on the turf beside him, laid his pardon at his feet.
In his brave, strong arms he clasped her, kissed the face upturned and white,
Whispered: "Darling, you have saved me; curfew will not ring to-night!"

OH, LOOK AT THE MOON!

These simple child-like verses were written by an American lady, named Eliza Lee Follen, about seventy years ago. Mrs. Follen was born in 1787 and died in 1860; she wrote many similar old-fashioned pieces, chiefly for young people.

Oh, look at the moon!
She is shining up there;
Oh, mother, she looks
Like a lamp in the air.

Last week she was smaller,
And shaped like a bow;
But now she's grown bigger,
And round as an O.

Pretty moon, pretty moon,
How you shine on the door,
And make it all bright
On my nursery floor!

You shine on my playthings,
And show me their place,
And I love to look up
At your pretty bright face.

And there is a star
Close by you, and may be
That small, twinkling star
Is your little baby.

MINE HOST OF THE "GOLDEN APPLE"

It is a very old custom for inns and public-houses to adopt some sign to distinguish them The "Red Lion," the "Green Man," the "Bunch of Grapes," and such like are familiar. The "Golden Apple" has also been so used, but here a poet reminds us that the place where Nature's apples grow is better than that with the painted sign of the "Golden Apple." The verses are by Thomas Westwood.

A goodly host one day was mine,
A Golden Apple his only sign,
That hung from a long branch, ripe and fine.

My host was the beautiful apple-tree;
He gave me shelter and nourished me
With the best of fare, all fresh and free.

And light-winged guests came not a few,
To his leafy inn, and sipped the dew,
And sang their best songs ere they flew.

I slept at night on a downy bed
Of moss, and my host benignly spread
His own cool shadow over my head.

When I asked what reckoning there might be,
He shook his broad boughs cheerily:
A blessing be thine, green apple-tree!

ROCK OF AGES

This beautiful hymn was written by Augustus Montague Toplady. It is found in many church hymnals, and has become familiar and dear to the hearts of many of us.

Rock of Ages, cleft for me,
Let me hide myself in Thee.
Let the water and the blood,
From Thy riven side which flowed,
Be of sin the double cure—
Cleanse me from its guilt and power.

Nothing in my hand I bring—
Simply to Thy cross I cling;
Naked come to Thee for dress—
Helpless look to Thee for grace;
Foul, I to the Fountain fly—
Wash me, Saviour, or I die.

While I draw this fleeting breath,
When my eye-strings break in death,
When I soar to worlds unknown,
See Thee on Thy judgment-throne,
Rock of Ages, cleft for me,
Let me hide myself in Thee.

A PRAYER

Lord, who art merciful as well as just,
Incline thine ear to me, a child to dust.
Not what I would, O Lord, I offer Thee,
Alas! but what I can.
Father Almighty, who hast made me man,
And bade me look to heaven, for Thou there,
Accept my sacrifice and humble prayer.
Four things which are not in Thy treasury
I lay before Thee, Lord, with this petition:
My nothingness, my wants,
My sins, and my contrition.

ROBERT SOUTHEY.

A CANADIAN BOAT SONG

On the great rivers of Canada there is romantic life and adventure of a kind never to be found on the rivers of England, which are much smaller and homelier waters. Hence boat songs are very popular in Canadian poetry; but this fine song, which is rhythmic with the beat of the oars, was written by Thomas Moore, the famous Irish poet. If it is read to the time of rowing, it will be found to suggest the steady movement of the oars, just as Browning's famous poem on page 2291 suggests the gallop of the horse.

Faintly as tolls the evening chime,
Our voices keep tune and our oars keep time.
Soon as the woods on the shore look dim,
We'll sing at St. Anne's our parting hymn.
Row, brothers, row, the stream runs fast,
The Rapids are near and the daylight's past.

Why should we yet our sail unfurl?
There is not a breath the blue wave to curl;
But when the wind blows off the shore,
Oh, sweetly we'll rest our weary oar.
Blow, breezes, blow, the stream runs fast,
The Rapids are near and the daylight's past.

Utawa's tide! this trembling moon
Shall see us float over thy surges soon.
Saint of this green isle, hear our prayers,
Oh, grant us cool heavens, and favouring airs!
Blow, breezes, blow, the stream runs fast,
The Rapids are near and the daylight's past.

GERMAN FOLK-SONGS IN ENGLISH VERSE

Folk-songs are simple songs made by the folk, or people, for the most part, long ago. Compared with the music of to-day, folk-songs are like wild flowers beside garden flowers. Every nation has its folk-songs ; on this page and the next appears a selection from the German, translated into English by Mr. Alfred Percival Graves, M.A., an English school inspector, also famous as an author and song-writer, his merry Irish song about "Father O'Flynn" being popular all the world over. The words of these German folk-songs are simple and clear, and the tunes are easy to remember, with a good lilt about them. They are taught to German children at school, and the children grow so fond of them that they remember them all through their lives, singing them in their homes in the evenings, or in the open air when holidaying, or even when on the march as soldiers. We used to sing such songs in America long ago, and we are beginning to sing them again at our schools and concerts.

WERE I A BIRDIE TOO

Were I a birdie too, I'd fly away with you
Far o'er the foam ;
But since that cannot be, but since that cannot be,
I'll stay at home.

Still in the autumn light, valley and wood and height
Joyfully glow,
Free o'er the mountain-side still I can wander wide,
While the winds blow.

Then you, dear birdie, fly far, far across the sky ;
I must bide here.
But with the spring come back, but with the spring come back,
Do, birdie, dear !

THE SONG OF THE TWO HARES

'Twixt a hill and hollow, hollow pass,
Two young hares were lying ;
Nibbling at the juicy, juicy grass,
Nibbling at the juicy, juicy grass,
How the blades went flying !

When they'd both their little paunches filled,
Down they did squat them ;
Then, as in sleep they both were stilled,
Then, as in sleep they both were stilled,
Came a churl and shot them !

When they both had pulled themselves together,
And at last concluded
That they still were sitting on the heather,
That they still were sitting on the heather,
Down the hill they scooted !

THE DANCE OF THE FLOWERS

The lilies of the valley chime
Their joy-bells sweet and low.
Now, wild flowers, 'tis your dancing time !
What makes you dally so ?

Blue, yellow, white, they hurry up,
They're flocking faster still !
The daisy and the buttercup,
Wood-violet, daffodil.

Then O, while out of heaven the moon
Looks down with joyful glance,
The lilies ring and ring the tune,
The blossoms dance and dance.

Jack Frost he stamps his iron foot ;
" How dare you dance and play ? "
The lily-bells, alas ! are mute,
The blossoms hide away.

But hardly has that churl of churls
Forsook their favourite glen,
When hark ! the lilies' peal of pearls
Is wakening once again.

I hear myself its silver hum ;
At home how can I stay ?
O flowers, 'tis calling me to come
And dance with you away !

SON OF MY HEART

Sleep, sonny darling, your mother's delight !
Close your blue eyes up, there, close them up quite !
Everything's quiet all over the house—
Nothing is stirring but one nibbling mouse.

Angels as lovely, my laddie, as you,
Nodding and smiling, are watching us, too ;
When you are older, perhaps they will fly,
And wipe the big tear-drop from out of your eye.

Gilded by sunbeams now all your days go ;
Later, ah, later it will not be so !
Then, without number, Care's shadowy hand
Will keep away slumber as by you they stand.

Sleep, my heart's darling, the dark night is nigh,
Sleep on in safety, for mother is by.
Nay, never fear you, my own curly-pate,
Mother is near you, both early and late.

GOD ONLY KNOWS

Could you count the bright stars peeping
Through the sky so soft and blue,
Or the cloudlets gently creeping,
Tell me, could you count them too ?
Only God, who never slumbers,
In His head could hold their numbers,
For He made them every one.

Could you count the midges dancing
On the golden summer beam,
Or the little fishes glancing
Up and down the crystal stream ?
God has called them into being,
All their happy hours foreseeing—
That is why they frolic so !

Children, could you count the number
Of the little curly heads,
Starting out of rosy slumber
From their happy little beds ?
God the Father sees and knows them,
All His loving kindness shows them—
Knows and loves you every one !

THE HOBBY-HORSE

Hop, hop, hop!
Without stay or stop;
Over walls and fences flying,
Never jibbing, never shying.
Without stay or stop,
See my pony hop.

Tip, tip, toff!
Don't you shake me off!
Just you stop that mad curvetting,
Or the whip you'll soon be getting!
Do not shake me off!
Tipty, tipty, toff!

Ho, there, ho!
Woa, my pony, woa!
Ostler, ostler, Jinny, Joany,
Fetch the fodder for my pony!
Woa, my pony, woa!
Ho there, ho there, ho!

Whack, whack, whack!
How my whip I crack!
Wish that they would listen to me—
Yes, I think that that will do me.
How my whip I crack!
Whack, and whack, and whack!

Stay, now, stay!
Don't you run away!
For the journey still before you,
Hay and oats will quite restore you.
Don't you run away!
Stay, my pony, stay!

THE FIR-TREE

O fir-tree fine, O fir-tree fine,
How faithfully you flourish!
Not only in the summer's glow,
But through the winter's scourging snow,
O fir-tree fine, O fir-tree fine,
How faithfully you flourish!

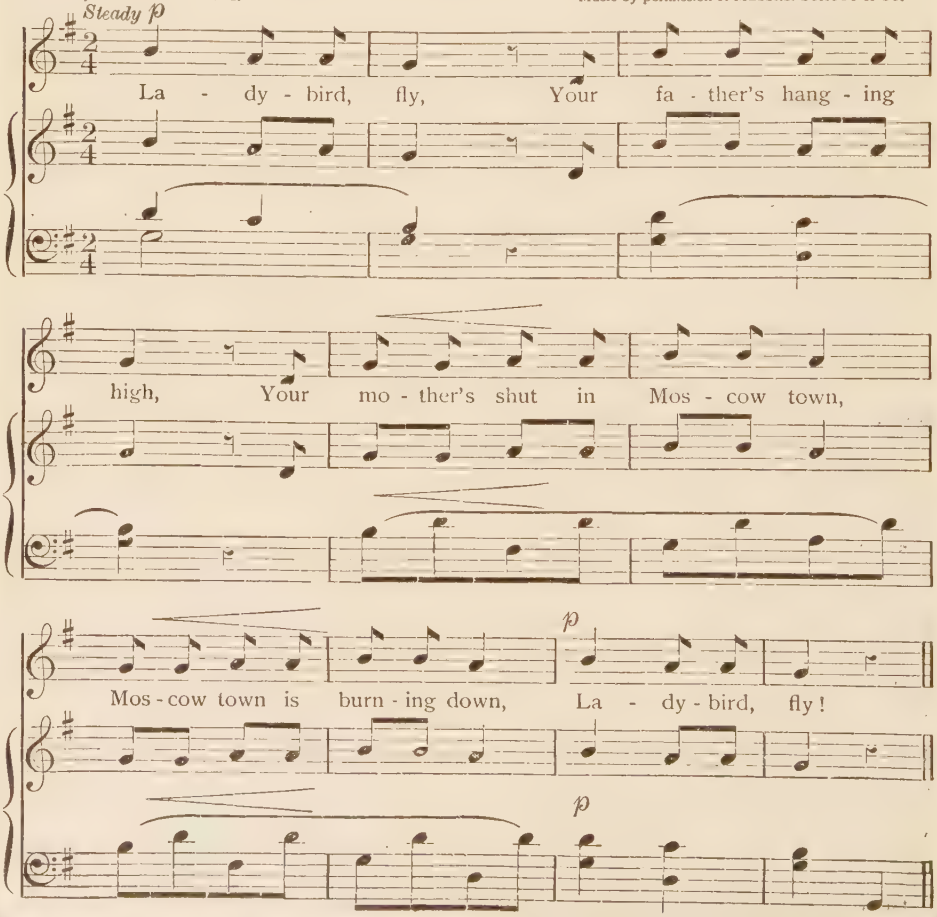
O fir-tree fine, O fir-tree fine,
What joy, what joy you've brought me!
When year by year your branches green,
My childhood's Christmas-trees have been,
O fir-tree fine, O fir-tree fine,
What joy, what joy you've brought me!

O fir-tree fine, O fir-tree fine,
From you I've learnt the lesson:
That hope and trust through trial keen,
Still keep our courage ever green.
O fir-tree fine, O fir-tree fine,
From you I've learnt that lesson!

LADYBIRD, FLY

Words by ALFRED P. GRAVES.

Music by permission of MESSRS. SCHOTT & CO.


Steady p
La - dy - bird, fly, Your fa - ther's hang - ing
high, Your mo - ther's shut in Mos - cow town,
Mos - cow town is burn - ing down, La - dy - bird, fly!
p
p

LITTLE VERSES FOR VERY LITTLE PEOPLE

In marble walls as white as milk,
Lined with a skin as soft as silk,
Within a fountain crystal clear,
A golden apple doth appear.
No doors there are to this stronghold,
Yet things break in and steal the gold.

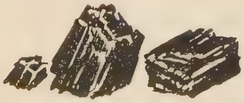
Long legs, crooked thighs,
Little head, and no eyes.

Flour of England, fruit of Spain,
Met together in a shower of rain
Put in a bag tied round with a string,
If you'll tell me this riddle,
I'll give you a ring.

I have a little sister, they call her Peep, Peep;
She wades the waters deep, deep, deep;
She climbs the mountains high, high, high;
Poor little creature she has but one eye.

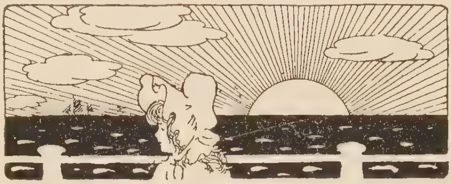
Arthur O'Bower had broken his band,
He comes roaring up the land—
The King of Scots, with all his power,
Cannot turn Arthur of the Bower!

Black we are, but much admired;
Men seek for us till they are tired.
We tire the horses, but comfort man;
Tell me this riddle if you can.



As I was going o'er Westminster Bridge,
I met with a Westminster scholar;
He pulled off his cap, *an' drew* off his glove,
And wished me a very good-morrow.
What is his name?

Hick-a-more, Hack-a-more,
On the king's kitchen door;
All the king's horses,
And all the king's men,
Couldn't drive Hick-a-more, Hack-a-more,
Off the king's kitchen door!



There was a king met a king
In a narrow lane;
Says this king to that king:
"Where have you been?"
"Oh, I've been a-hunting
With my dog and my doe."
"Pray lend him to me,
That I may do so."
"There's the dog, *take* the dog."
"What's the dog's name?"
"I've told you already."
"Pray tell me again."

As I went through a garden gap,
Who should I meet but Dick Redcap!
A stick in his hand, a stone in his throat,
If you'll tell me this riddle, I'll give you a groat.

Old Mother Twitchett had but one eye,
And a long tail which she let fly;
And every time she went over a gap,
She left a bit of her tail in a trap.

Thirty white horses upon a red hill,
Now they tramp, now they champ, now they stand still.

As soft as silk, as white as milk,
As bitter as gall, a thick wall,
And a green coat covers me all.

Cock Robin got up early
At the break of day,
And went to Jenny's window
To sing a roundelay

He sang Cock Robin's love
To the little Jenny Wren,
And when he got unto the end,
Then he began again.

Some little mice sat in a barn to spin;
Pussy came by, and she popped her head in.
"Shall I come in and cut off your threads?"
"Oh, no, kind sir; you will snap off our heads!"
"Oh, no, I'll not; I'll help you spin."
"That may be so; but you won't come in."

Queen Anne, Queen Anne, she sits in the sun,
As fair as the lily, as white as the swan.
"I send you three letters, so pray you read one."
You must read one, if you can't read all,
So pray Miss or Master throw up the ball.

In a cottage in Fife
Lived a man and his wife,
Who, believe me, were comical folk;
For, to people's surprise,
They both saw with their eyes,
And their tongues moved whenever they spoke.

When they were asleep,
I'm told—that to keep
Their eyes open they could not contrive;
They both walked on their feet,
And 'twas thought what they eat
Helped, with drinking, to keep them alive.

A pie sat on a pear-tree,
A pie sat on a pear-tree,
A pie sat on a pear-tree,
Heigh O, heigh O, heigh O!
Once so merrily hopped she,
Twice so merrily hopped she,
Thrice so merrily hopped she,
Heigh O, heigh O, heigh O!

There was a man of Thessaly,
And he was wondrous wise,
He jump'd into a quickset hedge,
And scratched out both his eyes.

But when he saw his eyes were out,
With all his might and main
He jump'd into another hedge,
And scratched them back again.

"Robert Barnes, fellow fine,
Can you shoe this horse of mine?"
"Yes, good sir, that I can,
As well as any other man;
Here's a nail, and there's a prod,
And now, good sir, your horse is shod."

My father he left me three acres of land,
Sing ivy, sing ivy;
My father he left me three acres of land,
Sing holly, go whistle, and ivy!

I ploughed it with a ram's horn,
Sing ivy, sing ivy;
And sowed it all over with one peppercorn,
Sing holly, go whistle, and ivy!

I harrowed it with a bramble bush,
Sing ivy, sing ivy;
And reaped it with my little penknife,
Sing holly, go whistle, and ivy!

The Old Woman Tossed in a Basket

There was an old woman tossed up in a basket,
Seventeen times as high as the moon;
Where she was going I couldn't but ask it,
For in her hand she carried a broom.

"Old woman, old woman, old woman," quoth I,
"Where are you going to up so high?"
"To brush the cobwebs off the sky!"
"May I go with thee?"
"Ay, by-and-by."

IS THERE A MAN IN THE MOON?

CONTINUED FROM 2880

THERE is certainly no life on the moon as we understand life. If the moon is inhabited at all it must necessarily be by a race of beings utterly different from anything we know on earth. For every living thing on our familiar earth is the creature of our local conditions. For instance, we breathe air, we are dependent on climate, and we are what we are in height and stature solely by reason of the density of the atmosphere. If the density of the air increased, we should become a squat people, unable to walk upright, and unable to lift a small weight; if the density of the air lightened, we could leap over hills and toss heavy weights above us.

Now, there is no atmosphere enveloping the moon, and so the race of possible beings inhabiting that lovely sphere must, to begin with, differ from us in the matter of breathing. They would be without noses and without lungs. And then think of their cities. A temple or a villa on the moon would last for ever. Air would not corrupt it, rain would not tarnish it, lightning would not rend it. Glass windows would not exist there, for without rain and wind who would think of glass windows? Such a thing as a kitchen, or even an ordinary fireplace, would not be found among them, for, as there is no air, no fire can be lighted, no match can be struck. And the people walking through the streets of this eternal city would be a dumb race. They would never speak, because speech does not exist without air; they would make no noise with their feet and with their traction, for sound does not exist without air. If it were possible for all the largest cannon of our earth to be discharged from the moon at the same moment, they would make less noise than a pin falling upon velvet. The moon might be filled with lovely flowers, but they would give off no odour. Birds might sing from every branch, but no note would be heard. Men might cry to the heavens, but not a whisper would escape their lips.

A soundless, airless, waterless city; eternal and incorruptible, as silent as death, as vivid as life!

WHAT ARE THE MARKS LIKE A FACE ON THE MOON?

If we look at the moon through a pair of opera-glasses, or, still better, through a telescope, we do not see the "face" at all. It merely happens that the marks sometimes look very like a face to the naked eye. The marks consist of mountains, mountain ranges, craters, and the sunken beds of what were once probably seas and oceans. The most prominent of these markings, and those which help most to give the appearance of a face, are made by volcano craters, and these are vastly different from any we know on the earth, because they are enormously larger. I suppose that all the volcanoes on the earth could easily be put together into the crater of one of the volcanoes on the moon. Some of these craters are scores of miles across.

If we have never looked at the moon with an opera-glass or a little telescope, we should do so. We lose the face, but we see far more, and it is not difficult even with a quite small glass to see exactly for ourselves what the markings that make the face are really due to. Often we can see the mountains best when the moon is not full, and then we see them standing out at the edge where the shadow and the light join. Some pictures of the moon and further facts about the wonderful mountain ranges and volcano craters on it are given on pages 2219 to 2225.

IS OUR EARTH A MOON TO OTHER WORLDS?

The general name for a moon is a satellite, or attendant. The earth itself has one satellite, which we call the moon; Saturn has nine; Jupiter has eight; and so on. A satellite is a body which revolves round some other heavenly body, which is usually called the satellite's *primary*. Our earth, then, and all the other planets, are satellites to the sun, and thus play the part of moons to the sun. But the sun is the only world to which the earth is a moon, for it is the only world around which the earth revolves. It may be that the sun revolves round some other great star, and so is a sort of moon to that star, in which case the whole of the sun's family, including the earth, would be "moons" to that star; but our leading astronomers now think that this is not the case.

WHY IS IT WARM IN SUMMER?

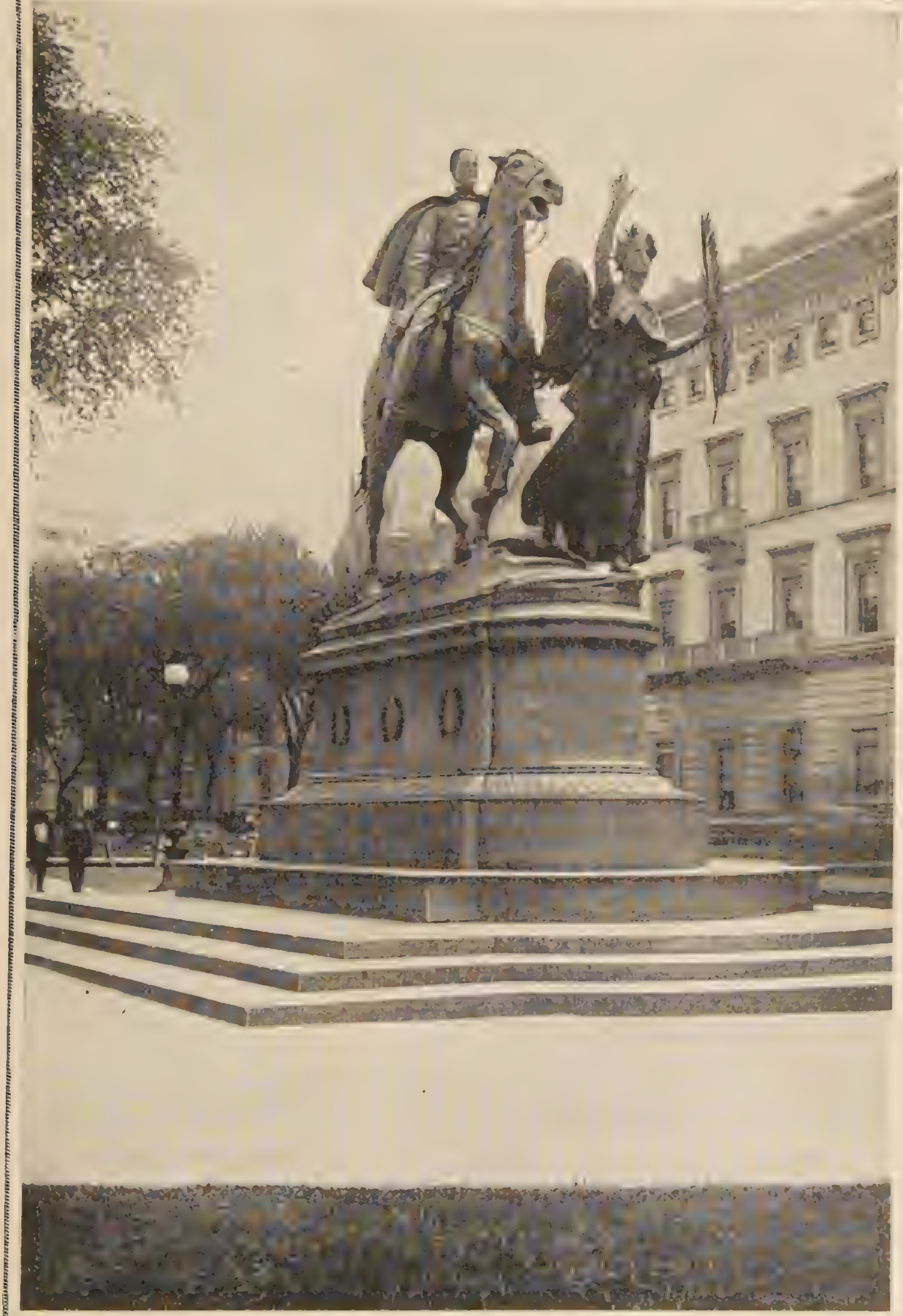
We might think at first that perhaps the earth is nearer to the sun in summer than in winter, and so the air is warmer and the sun's rays hotter. We know that the earth does not move in a circle round the sun, but in a sort of oval path called an ellipse. But the fact is that, though the earth is nearer to the sun during part of the year than it is during the rest of the year, it is nearest in winter and farthest in summer, in the Northern Hemisphere. The difference in distance is so small that it does not affect the weather much; but no doubt if the earth were nearer the sun in summer and farther off in winter, summer would be a little hotter and winter a little colder than it is.

That our distance from the sun does not make the seasons is plain when we remember that in our winter it is summer in Australia. It is warm in summer because then the sun's rays strike the earth more directly; the sun rises higher in the sky, as we say, and that means the same thing. The air is like a great blanket; it keeps heat in and it keeps heat out. If the sun's rays strike straight downwards to the earth through the air, they do not have to travel through so much of it as if they travelled through the air slantwise.

WHY IS IT COLD IN WINTER?

In winter the sun's rays have to pass very slantwise through the air, and so lose a great deal of their power. The reason of the difference between summer and winter—indeed, the cause of all the seasons—is that the earth is tilted on its axis, the line running through it from the North Pole to the South Pole. The globes made to represent the earth which help us to learn geography are always tilted. Imagine the sun as a strong lamp on the floor, and the earth as a spinning-top on the floor, going round the sun. If the top is spinning upright, then at every part of its path round the lamp it will be in the same relation to the sun. But if the top spins tilted, as the earth does, then part of the time the upper half of it will be tilted towards the sun and the lower half away from the sun; and on the other side of its path the upper half will be tilted *away* from and the lower half tilted *towards* the sun. We in the United States live on the upper half of the great top called the earth, and in our summer this half is tilted towards the sun, and in our winter is tilted away from it. So our summer is the Australian winter, and the Australian winter is our summer. The tilt makes all the difference to the sun's rays as

A GREAT STATUE OF A GREAT GENERAL



In another part of our book you may read of General William Tecumseh Sherman. This statue, modelled by Augustus St. Gaudens, our most famous American sculptor, was recently erected in his honour. It stands in the Plaza at one of the entrances to Central Park in New York City, and represents General Sherman as he appeared on the March to the Sea. The female figure represents Fame or Victory. This is considered to be one of the finest statues in the United States.

they pass through the atmosphere. It might have been that the earth was not tilted in its path round the sun, and then we should have had no seasons.

WHY IS IT HOT AT THE EQUATOR?

We know that the Equator is the name given to the great line that we imagine to run round the middle of the earth. Of course, there is no *real* line, except on the maps and globes. The belts, or zones, of the earth on both sides of the Equator are called the tropic zones, and are the hottest parts of the earth's surface. The reason is that, no matter whether it is summer or winter, farther north or farther south, in the temperate zones—in one of which England is—the tropic zones are always very directly exposed to the sun's rays, which strike through the air very straight down instead of slantwise. So the sun rises very high up into the " top " of the sky in the tropical regions, and so it is always very hot there. But it is too hot for human life at its best, and the greatest works of man have been done on one side or other of the tropical region.

WHY CAN STILL WATER REFLECT THINGS FROM A DISTANCE?

The distance from which the light comes has nothing whatever to do with what happens to it. Still water, like many other surfaces, is a very exact reflector of light. It throws the light-waves back from itself without mixing them up or distorting them. So long as it does this, we can see the image of whatever threw the light. It matters not in the least how far the light has travelled before it reached the water. You can see trees reflected in it, but you can see the moon or the sun reflected in it equally well, though they are scores of millions of miles away.

WHERE DOES PUMICE-STONE COME FROM?

We think of pumice-stone as merely something that rubs our skin so hard that it will take out ink-stains, but it has a wonderful history. The word is really the same as the Latin word *spuma*, which means foam, and we can see for ourselves that this stone is very light and spongy, so that it is almost like foam. It is spongy and full of spaces because it was formed under the influence of intense heat, and the spaces in it were filled with gas when it was made. Pumice-stone is really volcanic rock, formed deep in the earth and thrown out upon the surface from the crater of a volcano. A particular value it has for our knowledge of the earth is that its composition tells us something of the deeper part of the earth's crust. Specimens of pumice-stone, and of the other volcanic rocks, are now being carefully examined to see how much radium they contain in them. When we know this, we shall get some idea of the quantity of radium in the earth's crust at depths about which we cannot yet learn in any other way. The great importance of this is that radium produces heat, and so we can learn how the earth is kept warm, and how much longer it is likely to remain warm, even apart from the sun's help.

WHY CANNOT WE MAKE COINS?

If we had the minting machinery, and if we had gold and the metals which are added to it to make it harder, we could make gold pieces ; but we should not be allowed to do so. Even though they were the same in every way as the gold pieces made at the Mint, this would not do, for it is necessary to know how much money is in circulation ; and if people could add as much as they pleased to it, this could not be known. Every gold piece added to the circulation of money slightly lowers the value of all the others. In any case, we should not do this, for it would not be worth while. We could get better value for our gold by selling it to the Government—that is to say, we could exchange it for gold pieces, and get more for it than we could make if we had to pay for the machinery and the work.

When men called counterfeiters make " gold pieces," they do not use gold, or, at any rate, they use only a little to gild the coins, so that they may look like gold pieces. If we get twenty real dollars or a real gold piece for a piece of gilded lead not worth a penny, it is theft, and that is why it is not allowed.

WHAT ARE THE GROOVES ROUND THE EDGES OF MONEY FOR?

Pennies and nickel pieces have smooth edges, but silver and gold coins are " milled," as it is called, round the edge. The reason is that people used to pare the edges of coins, especially gold coins, and then sell the precious metal. This is, of course, a form of theft from the nation's money, and the best way of stopping it was found to be to " mill " the edges of the more valuable coins, so that no one could pare them without letting it be seen at once. Other coins are not milled because it would be worth no one's while to pare their edges.

WHAT MAKES THE BRIGHT COLOURS WE SEE WHEN WE SHUT OUR EYES?

The nerves of sight always produce sight, whatever excites them; that is usually light, but it may be many other things. Pressure is one of them, and that is why we "see stars" when we get a blow on the eye. When we shut our eyes very tightly we cause some pressure on the eyeball, and so there are sensations of light produced. Also, there are various things in the eye which get lit up by light, and reflect it for a short time even after the eye is shut. Then the curtain at the back of the eye sees these things. We often see things that are in our own eyes in this way. Also, the retina has a way of seeing things more or less faintly after the eyes are shut, and these images are called after-images. Sometimes they are bright, as the thing itself was, and sometimes they are seen as dark images corresponding to the bright thing we have been looking at. Lastly, we must remember that the eyelids allow a certain amount of light to pass through them, so that we still see a little even when we close our eyes in the presence of light. In people who are not well, the brain may give the sensation of light in closed eyes, apart from any light that really exists, and apart from after-images.

WHAT ARE THE SPOTS THAT COME BEFORE THE EYES?

Spots before the eyes are of two distinct kinds. The one kind is permanent. The spots are always there, and always in the same place. They are due to something that should not be in the eye—most commonly a speck of the *cornea*, or the front part of the eye, that is not transparent, having been damaged in some way. Such opaque spots in the cornea throw shadows on the retina and are so seen as spots before the eyes.

The second kind of spots is quite different. These are not permanent. They seem to be in different places at different times. Usually we do not notice them at all. They are the shadows thrown on the retina by white blood-cells moving through the fluids inside the eye, and so getting in the way of the light. As these cells move about, of course, the shadows they throw are not seen always in the same place. White cells are always travelling about in the eye, more or less, but usually we do not notice them.

When we have been awake all night, or have got tired from staying up too late and getting too excited, then we get spots before our eyes, because our nerves have been made *too* sensitive, and so they notice the shadows of these cells, which a healthy eye does not notice. It is one of the most important facts about living matter, especially nerves, that when they are weak they get *too* sensitive or irritable; and this is called "the irritability of weakness."

WHERE DOES ALL THE DUST GO TO?

Dust is made of very different things, and its fate varies accordingly. Some dust is mainly made of particles of carbon, and these are gradually washed into the soil by the rain. We do not know whether they are useful there. Some of them get into our lungs and stay there. Then much dust is made of organic matter—substances derived from living creatures, such as horses, for example.

These street deposits of animals are a very important part of town dust. They find their way into the sewers, and so to the sea; or often to the soil, where, like all organic matter, they are extremely useful for the growth of vegetable life. This dust often gets into our eyes and throats, and probably helps to cause the colds that are so common in towns. Town dust will be really healthier when horses, dogs, and cats are kept under better control—if, indeed, they are allowed in towns at all. Also, a considerable part of the organic matter in dust is consumed and oxidised by the oxygen of the air, partly under the influence of the sun, and partly by the action of microbes.

WHY IS THERE SHINGLE ON PARTS OF A COAST, AND SAND ON OTHERS?

This depends on the earth's crust in various places. The shingle that we find on the south coast of England is made by the action of the sea on rocks made by fire, and therefore called *igneous* rocks, from the Latin word for a fire. Often near the layer that forms the shingle there is a layer of chalk, and that is also broken down by the sea-water. Chalk, as we know, is a deep-sea deposit of the bodies of living creatures. On the east coast the history of the earth's crust has been different. There the exposed layers have been mostly formed by deposits of material at the bottom of the sea. This forms the very crumbly sort of rock called sandstone—a good example of the opposite class of rocks to those called igneous. The sandstone class of rocks is called *sedimentary*, because they were formed as a sediment, or deposit, under the water. Nevertheless, the same elements, silicon and oxygen, compose both sand and shingle.

WHAT DO WE MEAN BY GREENWICH TIME?

It is plain that as the earth spins round, the sun must appear to rise in the east sooner, the further east we are, and later, the further west we are. So the apparent time, judged by the sun's rising and setting, is different in different places, according as they are east or west of each other; indeed, midday on one side of the earth is midnight on the other side. It is not a question of north or south, because the earth does not spin in the north-south line, but in the east-west line.

So it is necessary to have some agreed place from which to take our time, and the place on which many nations have agreed is Greenwich. They have their own time for their own purposes; but for general purposes, as, for instance, events occurring in the sky, they refer to Greenwich time—that is to say, the time reckoned by what the sun seems to do at Greenwich. The lines on maps up and down the earth's surface from north to south are called lines of longitude. They are narrower in the north and south than at the Equator, of course, and meet at the Poles—like the lines usually made by the knife when we cut a melon in the most usual way. Places on the same line of longitude as Greenwich have Greenwich time exactly, and no other place can have it.

WHY DOES TIME GO ON AND NEVER STOP?

It is very difficult for us to understand at first, but there is really no such thing as time. All the wise men who have thought about it are entirely agreed as to this. What goes on and never stops is *change*. There is change around us, as in the movements of the earth, and the moon, and the sea, and animals, and there is also change in ourselves, in our bodies and in our minds. It has been said that "nothing is constant but change." We get our idea of what we call time from our experience of this change in ourselves and in what is around us. This change never stops, and so we say that time never stops. We take something that changes regularly, such as the position of the earth as it moves round the sun, and we measure time by that; or we take the change of day and night. If everything that happens, within us and without us, were to happen a thousand times more slowly, we should not notice that things were happening more slowly; there would be nothing, within us or without us, to notice it by.

If change were to cease; if everything stayed where it is at this moment, say, four o'clock in the afternoon; if the shadows grew no longer, and night did not come; if we did not get hungry or thirsty; if our minds did not think of things, and if our limbs did not get tired, and if everything whatsoever, within and without, were to remain exactly as it is this instant—then there would be no time until change began again. We all think at first that that is not true, but the reason why we do think so is that we cannot help thinking of change as going on somewhere, and so of time as going on too.

WHY IS A SNOWFLAKE LIGHTER THAN A RAINDROP?

A snowflake is made of ice-crystals—that is to say, of solid water. Now, it is a most important and peculiar fact about water that ice is lighter than liquid water, even though it is colder. The general rule, of course, is that things get heavier as they get cooler and lighter as they get hotter, as heat expands them and cold contracts them. But at just near its freezing-point water does not obey this rule; it *expands* as it gets cooler and freezes. That is why it bursts pipes in winter. So a snowflake is made of water in a lighter state than the water in a raindrop, and yet another reason why the snowflake is lighter is that there is a great deal of air in among the ice-crystals. This makes the whole thing lighter, just as the air in the holes of a sponge makes it lighter.

The next Questions are on page 3089.

WHAT THIS STORY TELLS US

CANADA has many birds because, as yet, the population has not been great enough to destroy them. A few of those described below are found only in Canada, others live with us the entire year, though they may also be found elsewhere, but more are summer visitors, and spend the winters farther south. In this article you will find excellent descriptions of the birds, with interesting accounts of their habits. Dr. Hamilton has emphasised the fact that many of them are our good friends because of the millions of injurious insects they destroy.

COMMON LAND BIRDS OF CANADA. I

> " A light broke in upon my soul —
> It was the carol of a bird;
> It ceased — and then it came again,
> The sweetest song ear ever heard."
> BYRON.

IN Canada we have many birds. In the warmer sections of the country about two dozen are permanent residents, and a dozen or more are winter visitants. The great majority of our summer residents arrive from southern United States, the West Indies, and Central America, in spring and early summer, and leave us for those warm regions when cold nights foretell the approach of winter.

THE DRUMMER OF THE WOODS

Among permanent residents one of the most common is the Ruffed Grouse or Partridge. It, and other related species, are game birds protected by the game laws of the provinces. It is a bird about eighteen inches long, with upper parts chiefly brown variegated with black, gray and white; large tufts of broad, glossy black feathers on the neck; under parts chiefly white, tinged with buff and barred with blackish or grayish brown. The tail-feathers vary from gray to brown and are irregularly barred and mottled with black, with a broad dark band near the end. When the tail is spread it presents a beautiful, fan-like appearance.

Of all the characteristics of this superb game bird, its habit of drumming is the most remarkable. The sound is produced by the male bird beating the air with his wings as he stands firmly braced on some favourite low perch. It is the call to his lady mate, who approaches the old rendezvous, shy but responsive. The same perch may be used by the old male year after year. On the ground at the base of a stump or tree, or beneath brush, the nest is made. It may contain eight to fourteen pale yellowish-brown eggs about one and one-half inches long and an inch broad. The young can run about as soon as they are hatched, and when one week old can fly well. During the summer and autumn the grouse eats insects and berries and seeds, and in the winter leaves and buds. To keep itself warm during cold nights in winter, it burrows into a snow-drift and there passes the night. Sportsmen delight in hunting the Ruffed Grouse, and its flesh is much prized at the table.

OTHER MEMBERS OF THE FAMILY

The Canada Grouse or Spruce Partridge is a common inhabitant of Canadian coniferous forests. It has more feathers on the legs but the toes are bare. The throat is black, and is separated from the black breast by a broken circular band of black and white. The tail is black, tipped with brown. Its eggs are larger than those of the Ruffed Grouse, and are more or less speckled or spotted with deep brown.

Copyright, 1913, by M. Perry Mills.

The Quail, or Bob-White, belongs to the same family. He is only about ten inches long. The male in winter has upper parts varying from reddish-brown to chestnut, a black band on the upper breast, the throat and a broad line from the bill over the eye white, the lower breast and belly white barred with black, and an ashy-gray tail. On the ground in grassy fields, the female lays ten to eighteen white eggs about one inch broad. It is found only in the warmer sections of Eastern Canada.

RAIDERS OF THE AIR

Hawks are birds of prey. They often make raids upon the poultry-yard, and always prefer feathered game to any other. The Sharp-shinned Hawk and Cooper's Hawk are those which often attack poultry. They are both small but possess great boldness and dexterity. The former is about one foot long with upper parts slaty-gray, primaries barred with blackish, white throat streaked with black, under parts barred with white and buff, and an ashy-gray, nearly square tail with blackish cross-bars and whitish tip. Cooper's Hawk is very similar but larger, and with the crown blackish.

They build nests in trees, fifteen to fifty feet above the ground, and lay three to six bluish-white eggs about two inches long. Because of its larger size, Cooper's Hawk is more destructive to poultry. Both are fearless, daring, aggressive; and watching their prey from a lookout, then flying swiftly and low, they make a sudden dash at the frightened animal, and grasp it in their talons. They are often called "Hen Hawks" and "Chicken Hawks."

The latter names are also applied to the Red-tailed Hawk, and the Red-shouldered Hawk. Both like chickens. The former is about twenty inches long, with upper parts brownish; upper breast heavily streaked with grayish-brown; the upper belly streaked, spotted or barred with black forming a kind of broken band across the belly; the lower belly generally white, and the tail rich brown, with a narrow black band near its end, and a white tip.

The Red-shouldered Hawk is about the same size, with conspicuous reddish-brown "shoulder" patches, and a blackish tail with four or five white cross-bars and a white tip. Both are common species, but give little trouble to the farmer, though unjustly blamed for the sins of their bird-killing relatives. They live chiefly on mice, moles, frogs and insects. The hawks already described are permanent residents in most parts of Canada.

THE MANY HAWKS OF CANADA

The American Goshawk is a bird of northern regions, wintering as far south as Virginia. It is one of the most daring of all the hawks, and will dart down suddenly and carry off a chicken which may be only a few feet from a person. It is nearly two feet long, with upper parts bluish-slate colour; a blackish head and the breast and belly barred pale-slate and white, with sharp black streaks. It nests in trees, and lays two to five white eggs faintly marked with pale brownish. This hawk is so large and powerful that it is quite capable of killing and carrying off a full-grown hen.

The Marsh Hawk is often seen gracefully skimming over the low meadows, or occasionally hanging poised over one spot for a second or two and then dropping down into the long grass. This drop may mean the death of a mouse or a frog. It seldom attacks a domestic fowl, but destroys an enormous number of field mice each year. The male has gray or ashy upper parts, silvery-gray tail, irregularly barred with black, and lower breast and belly white with bars or spots of rufous. It lays four to six dull white eggs on the ground in marshes. The most unsuspicious of all hawks is the Broad-winged Hawk, which is chiefly distinguished from other species by the three "notched" primaries and its smaller size. It breeds throughout Eastern North America. During early summer it may be seen for hours sitting on the dead top of some high tree. It feeds chiefly on mice, reptiles and insects.

The American Rough-legged Hawk, a large species characterised by feathered tarsi and heavily marked under parts, breeds in Canada and winters in the United States. It is somewhat nocturnal in habits, and may be seen in the fading twilight watching from some low perch or beating with measured, noiseless flight over its hunting ground. Its flight is seldom rapid, and often appears laboured.

The Pigeon Hawk has slaty-blue upper parts, a rusty collar on the neck, three or four distinct grayish-white bars on the tail, and under parts of cream-buff or yellow streaked with black except on the throat. It nests in trees or on cliffs, and lives chiefly on small birds.

The American Sparrow Hawk is less than a foot long, with a brownish back more or less barred with black; slaty-blue head; under parts chiefly cream-buff, and belly and sides spotted with black. It breeds as far north as Hudson Bay and winters in the Southern States. Its call is a high, quickly repeated " killy-killy-killy-killy "; and, as the name suggests, it lives on small birds, mammals, and insects.

THE FISHERMAN THAT SELDOM MISSES

The Fish Hawk or American Osprey is a common species. It has upper parts, head and nape brownish, varied with white, and white under parts. This species lives in colonies or in pairs, along our coasts, and returns year after year to the same nesting ground. Its note is a high, rapidly repeated, plaintive whistle. It is a good fisher. Winging its way slowly over the water, it keeps a close watch for fish. When one is observed, it hovers for a moment, then descends with rapid speed and directness, strikes the water with great force, making a loud splash, frequently disappears for a moment, then rises with its prey grasped in its powerful talons, and flies to a favourite perch.

The Golden Eagle is of rare occurrence east of the Mississippi, but the Bald Eagle breeds throughout North America. The head, neck, and tail are white, and the rest of the plumage brownish. They live chiefly near water, and subsist principally on fish. The nest is found in tall trees and contains two or three dull white eggs nearly three inches long.

NIGHT BIRDS OF PREY

Owls are found in all parts of the world, and about twenty species inhabit North America. They are chiefly woodland birds, while some make their home in towers or outbuildings. Owls are birds of prey, and birds of the night, living chiefly on small mammals. They have weird, human voices, and are usually regarded with superstitious fear. Their eggs are uniformly white and unmarked. Only a few common species will be described.

The Long-eared Owl has conspicuous ear-tufts an inch or more in length; upper parts brownish mottled with white; a tail with six or eight cross-bars, and sides and belly irregularly barred with brown. It spends the day in the shade of evergreens. " Like other owls, its flight is slow and wavering, but in common with them it is buoyant and devoid of any appearance of heaviness.

The Barred or Hoot Owl has no ear-tufts. The upper parts are grayish-brown; the under parts white; the breast barred, and the sides and belly broadly streaked with brown. The deep-toned, questioning voice, the absence of " horns," and the dark-brown, nearly black eyes, combine to make Barred Owls appear strangely human. Their usual call is a sonorous " whoo-whoo-whoo " uttered during the first part of the night and again before sunrise; or on moonlight nights throughout the night. The Saw-whet Owl is only about eight inches long. Its upper parts are cinnamon-brown; the back spotted with white; the tail with three or four imperfect white bars; the under parts white, heavily streaked with cinnamon-brown, and the legs and feet feathered and buffy-white. It nests in a hole in a tree. During the day it frequents dark woods, and sleeps so soundly that often it may be captured alive. The Screech Owl is known by its small size and ear-tufts when seen; and when night comes, by its tremulous, wailing whistle — a weird, melancholy call welcomed by few. It frequently makes its home near dwellings, and may nest in them. Its favourite retreat is an old apple orchard, where the hollow limbs offer it refuge by day from smaller birds which may attack it.

THE GREATER OWLS

The Great Horned Owl is nearly two feet long, and has conspicuous ear-tufts nearly two inches long. The upper parts are mottled with varying shades of buff and black; there is a white patch on the throat, and the under parts are a yellow-buff barred with black. The legs and feet are feathered, and the eyes are yellow. The Great Horned Owl is common in wilder, less settled, wooded regions, and is very fond of rabbits. Its call is a loud, piercing, blood-curdling scream. The Snowy Owl is a bird of cold, northern regions, but may wander southward in winter. It is large without ear-tufts, and is white, with bars of grayish-brown. The legs and feet are heavily feathered, and the eyes are yellow. Its flight is firm, smooth and noiseless. It is diurnal in its habits, and is most active during the early morning and again before dusk. The Hawk Owl is also diurnal in habits, and its flight is swift and hawklike. It breeds in northern regions, and comes south in winter. The size is medium; the upper parts grayish-brown; the head and neck spotted with white; the under parts barred with brown and white, and the tail long and rounded.

WOODPECKERS OF VARIOUS KINDS

Woodpeckers, of several species, are common in Canada. As a rule they are solitary, and are the best climbers among all birds. Two toes of each foot are directed forward and two backward, except in one group, and this structure of the feet, together with the pointed, stiffened tail-feathers assists them in clinging to upright surfaces. The bill is stout and chisel-like, and is used to cut away wood and reach grubs, which are drawn out of their hiding-places by the long tongue with its horny tip. Woodpeckers nest in hollowed-out places in dead trees, and lay white eggs.

A most common species is the Hairy Woodpecker, which is about ten inches long, with black upper parts, white under parts, wings spotted with white, a white stripe above and another below the eye, and the adult male has a scarlet patch on the back of the neck. The Downy Woodpecker is very similar in colour and markings, except that in the latter the outer tail-feathers are white barred with black, and in the former they are white without bars. The Downy is shorter, and the feathers more downy and fluffy. He is the smallest and the best known of all our Woodpeckers. He visits the orchard and shade trees, and tells of his presence by the tap, tap, tap, on the trees as he patiently digs out grubs and larvæ. The valuable work done by these birds for the protection of our trees should commend them to every nurseryman. The toughest cocoon ever spun by a caterpillar is no protection against the sharp beaks of these birds. The food of both birds consists almost entirely of insects, with the seeds of the hemlock or the berries of the sumach for dessert.

The most beautiful bird of the family is the Red-headed Woodpecker with the head, neck, and upper breast deep red, the lower breast and belly white, and the upper parts and the tail black except the white rump and white patches on the wings. The Downy and the Hairy are winter residents but the Red-headed migrates southward in the autumn. They are noisy, active birds; and their brilliant plumage and loud, rolling call make them conspicuous. In early spring they feed on insects, which they catch on the wing; but after the small fruits ripen their tastes change, and they visit the strawberry and raspberry patches.

A WOODPECKER WITH FORTY NAMES

The Golden-winged Woodpecker has more colours and more names than any other bird. A few of its forty names are Flicker, High-hole, and Yellow-hammer; and these names are the reflections of its habits, notes and colours. The top of the head is a sky-gray; across the neck is a bright scarlet band; the upper parts are brownish-gray, barred with black; the sides of the head, throat and upper breast are yellowish-brown; a broad black stripe on either side of the throat runs backward from the base of the bill; a broad black crescent spans the breast; the under parts are white tinged with yellow, and the tail is black above, and yellow tipped with black below. The Flicker is a bird of character, and does not always follow the habits of the family. It does less woodpecking than any other of its class, and is really a ground feeder, living chiefly on grasshoppers, and other ground insects.

The Yellow-bellied Sapsucker is another Woodpecker. The adult male has a crimson crown and chin, black and white wing coverts and back, wings black with a large white bar, black tail, breast black edged with yellowish, and the under parts dull yellowish and white sides streaked with black. It is a small woodpecker, which prefers sap to insects. In spring when the sap is rising it bores small holes in the bark of various trees, and sucks the sap which flows from the holes. Apart from this habit, which may render young trees somewhat unsightly, the bird has an excellent record. It devours great numbers of ants, beetles and moths, which it obtains chiefly from rotten wood. It is a summer resident only in Canada.

THE "COCK OF THE WOODS"

The Pileated Woodpecker, known as the "Cock of the Woods," is about seventeen inches long, and is the largest of our woodpeckers. The male has a scarlet crown and crest, and a red mark extending back from the bill. The upper and under parts are brownish-black, and a broad white stripe extends from the bill backwards, on either side, to the wings. This bird is common only in the wilder parts of the country. Its flight is rather slow, and when under way, the markings of the wings show plainly. The Arctic Three-toed and the American Three-toed, as the names suggest, have only three toes on each foot, two in front and one behind. They are restless, active birds of northern regions.

The Nuthatches are closely related to the Woodpeckers. We have two species, the White-breasted and the Red-breasted. They are resident species frequently seen around cultivated lands in the winter. They are active insect destroyers, picking their food from bark, twigs and leaves; and are of great value to the fruit-grower because of the immense quantities of insect eggs and larvæ which they destroy. Their call is a nasal "yank-yank" and a repeated "ya-ya," all in the same tone. The White-breasted Nuthatch is about six inches long, with a bluish-black crown, slate upper parts, white under parts, and a short tail. The Red-breasted has the top of the head and a wide stripe through the eye shining black, a white line over the eye, the upper parts bluish-gray, the throat white, and the under parts reddish-brown. Few birds are more easily identified.

THE CHICKADEES

Chickadees are permanent residents, and are also insect-eating birds. They closely inspect the bark of trees for insect eggs and larvæ.

"Were it not for me,
Said a chickadee,
Not a single flower on earth would be;
For under the ground they soundly sleep,
And never venture an upward peep,
Till they hear from me,
Chickadee — dee — dee."

The Black-capped Chickadee is a small, fluffy bird with top of head, nape, and throat shining black, the sides of the head and neck white, the back ashy, the breast white, with belly and sides washed with cream-buff. It builds a nest of moss, grass and feathers in old stumps, and lays five to eight small white eggs, spotted and speckled at the larger end with brown. The Hudsonian Chickadee has a dull, dark brownish-gray crown. No bird speaks its name so plainly as a chickadee, and no bird has more friends, because he is sociable with all. In an unconcerned way, he hops from limb to limb, whistling softly the while, picking an insect egg from this crevice in the bark and a larva from another, all the time performing acrobatic feats. After satisfying his appetite, he looks at the onlooker with his sparkling black eyes, speaks to him in liquid gurgles, and then flies away to the woods.

THE LITTLE BROWN CREEPER

The Brown Creeper is another small bird which, like the Chickadee, searches for insects, eggs and larvæ which are hidden in crevices of bark. He starts at the bottom of the trunk, and winds his way upward in a near-sighted manner. Having reached the top of his spiral staircase, he suddenly drops to the base of another tree and resumes his task. The upper parts are mixed brown and white, the rump pale brown, the tail grayish-brown, with feathers stiffened and pointed, and the under parts white. It builds its nest in the loose bark of a tree and lays five to eight, spotted and speckled eggs.

"Although I'm a bird, I give you my word
That seldom you'll know me to fly;
For I have a notion about locomotion,
The little Brown Creeper am I,
Dear little Brown Creeper am I.

"Beginning below, I search as I go
The trunk and the limbs of a tree,
For a fly or a slug, a beetle or bug;
They're better than candy for me,
Far better than candy for me."

CROWS AND BLACKBIRDS

A Crow can speak for himself, and is well known to Canadian children. He is about twenty inches long, and black all over. The farmer is well acquainted with his corn-pulling habit, and even the "scare-crow" does not frighten him. He is a vegetarian to the extent of two-thirds of his diet, and one-half of this vegetable matter consists of grain, chiefly Indian corn. Sometimes he is guilty of destroying the eggs and young of small birds. On the other hand, he does much good by destroying injurious insects, mice and other rodents, and is valuable occasionally as a scavenger. He seems to rejoice in being an outlaw. He knows no fear, and laughs at attempts to entrap him. For many years, man has been his sworn enemy, yet he has held his own. That he has a language of his own no one who has listened to him will doubt, but who can translate it?

Blackbirds are closely related to crows, but are much smaller. Both walk, while most birds hop. The Bronzed Grackle or Crow Blackbird breeds as far north as Labrador, and winters in the lower Mississippi Valley. It is about six inches long, and black all over. About the neck, throat, and upper breast, the male is a brilliant metallic-purple to bluish-green. The Rusty Blackbird is smaller, and the plumage of the male is a uniform glossy bluish-black. The female is slate-colour in spring, and rusty-brown in fall and winter. The Red-winged Blackbird is distinguished by the patch of red and cream on the shoulders in the male. The female is smaller, grayish-brown, and heavily streaked with brown or black.

Blackbirds are not liked by the farmer. Little can be said in their favour, except that at times they eat a large number of cutworms. They are early migrants, arriving in March and resorting at once to their nesting places in swamps or woods. Early in the season they live on insects, but as soon as grain is sown they visit the sown fields and help themselves liberally, varying their diet by robbing the nests of smaller birds, and taking as many eggs and young as they can.

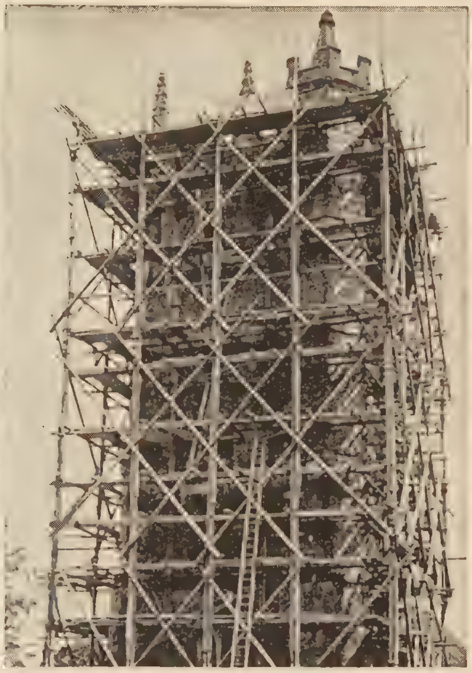
THE WICKED COWBIRD

The habits of the Cowbird are interesting. It is a small bird, about eight inches long, with head, neck and breast coffee-brown, and the rest of the plumage, in the male, glossy black. He is an acknowledged villain. They are the only birds that neither make a nest of their own, nor care for their young. When a smaller bird, a sparrow, a warbler or a vireo is absent from her nest, the Cowbird slyly deposits her egg in the nest. The ill-gotten offspring is born with the cowbird character fully developed. It is strong and gluttonous, and gets most of the food which the foster-parents bring, and grows rapidly. The rightful occupants of the nest are starved out or crowded out of the nest before they mature. Cowbirds have no song. They are much given to following cattle in the pasture, clustering about their feet and feeding on the insects found there — hence the name, Cowbird.

Continued on page 3488.

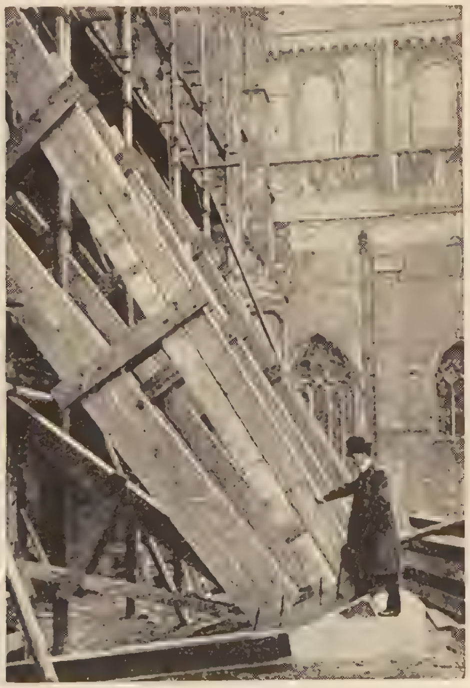
HOW BUILDINGS ARE SAVED FROM RUIN

Buildings need careful mending. An ordinary builder cannot repair a church spire. Only steeplejacks, used to working at great heights, can do this work.



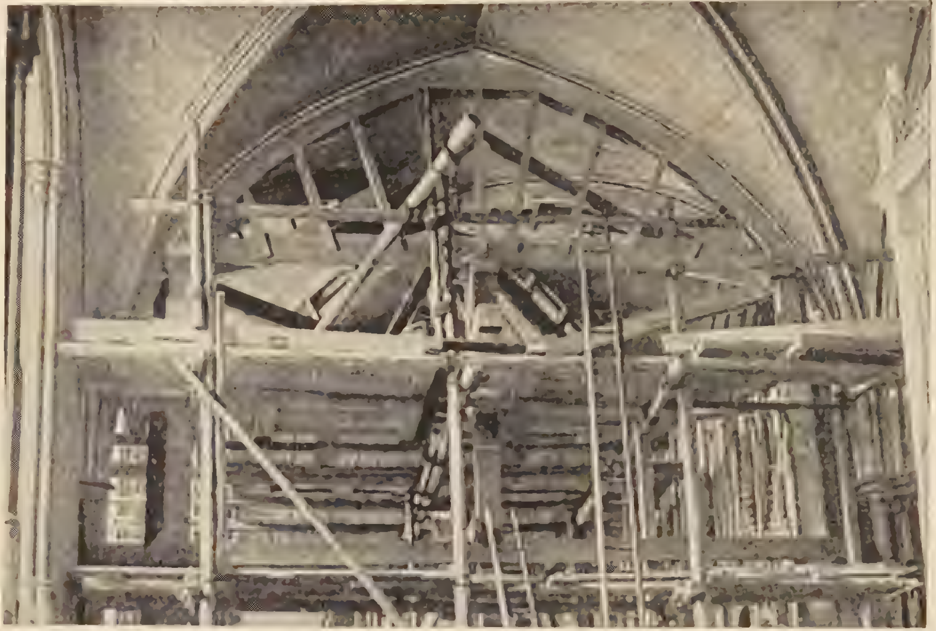
When a tower like this needs repair, a great scaffold has to be put up. Here all the cracks caused by years of frost are being carefully filled in with cement.

When it was discovered that the old foundations of Winchester Cathedral were beginning to crumble away, scaffolding had to be put up inside and outside to support the building while the repairs were being made.

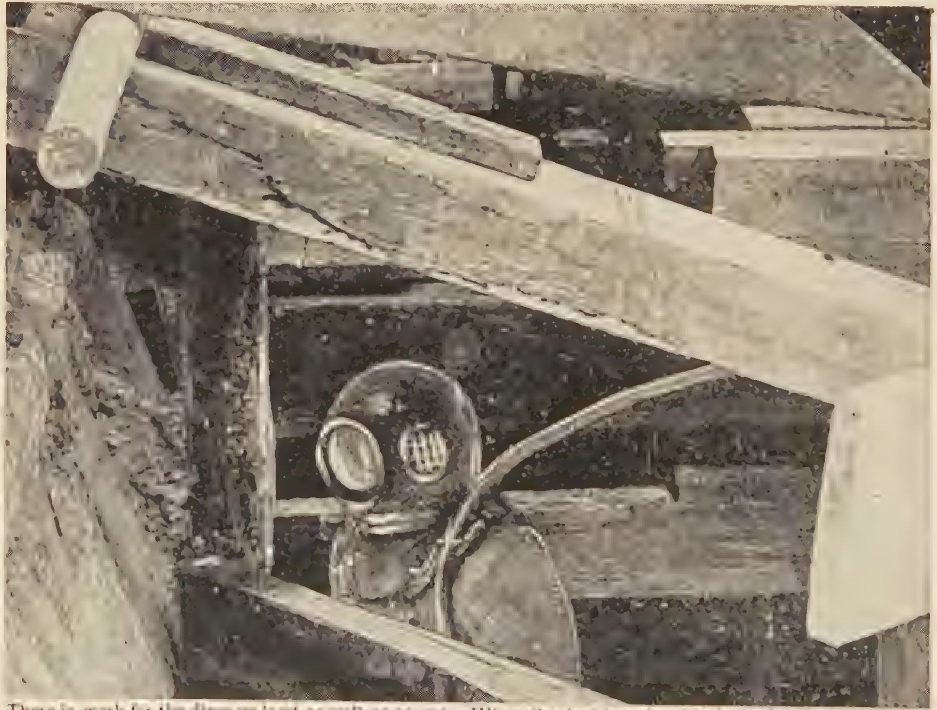


To prevent the walls from falling outwards, a huge timber framework had to be built up outside the cathedral, and this cost $5,000. Here we see some of the scaffolding, which weighed many hundreds of tons.

A DIVER WORKING UNDER A CATHEDRAL

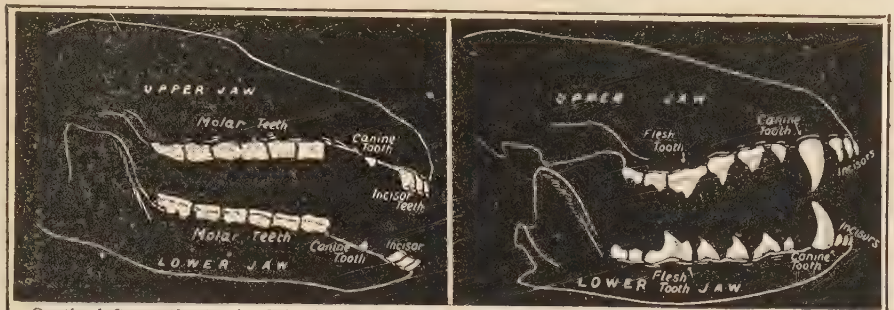


It is useless to have beauty and strength in the upper part of a building if the foundations are in a ruined and crumbling condition. This picture shows how the roof and arches of Winchester Cathedral were supported by a casement of wood, which exactly fitted and kept them in place while the foundations were repaired.



There is work for the diver on land as well as at sea. When the builders dug big holes by the side of the walls of Winchester Cathedral, water from underground springs poured in. An ordinary mason would have been drowned, or driven from his work; so divers had to be employed to fix the stones and cement which form the new foundations of the cathedral. Engines pump the water out of such holes as fast as they can, but when the flow is too heavy for the engines, the divers can work without fear.

THE NEXT FAMILIAR THINGS ARE ON PAGE 3097



On the left are the teeth of the horse, which lives on grass, with a flat top for grinding grass. On the right are the teeth of the wolf, which lives on flesh, with sharp fangs for tearing

HOW AND WHEN TO EAT

CONTINUED FROM 2927

WE have carefully studied the first and most important of human foods, which is milk. Without milk none of us could grow up to eat anything else, so its place as first of all foods is beyond question. And we have studied the great cereal foods and their value to the whole of mankind. But we know that men eat other food besides milk and bread; we all do so, civilised and savage, if we can get it, and we are better for it.

This is one of the supreme facts about mankind—a fact which helps to explain many of the most striking things in our history and our present lives. The idea is that man should and does make use not of one thing, or two, or three, of all that Nature produces, but of many or all of her products. We can do this because we have been made capable of suiting ourselves to all circumstances, and if we are deprived of one thing we can make another take its place. Now, when a chair, say, can be adapted to become a table, we call it adaptable.

So when a living creature, that usually lives in one climate and on one food, can live in another climate and on another food, we call it adaptable, and say that this is an instance of *adaptation*. All living creatures have some range of adaptation—as, for instance, to the change of temperature produced by night and day; but man is vastly more adaptable than any other living creature—animal or vegetable—and to this wonderful power he owes the fact that, while other creatures can live only in this, or that, part of the world, man can and does live anywhere, and in any circumstances. Now, this very largely means that he can eat a greater variety of foods, and live upon them more successfully, than can any other creature.

This does not mean that cabbages are as good a food as milk, or that there is no real difference between eating meat three times a day and eating no meat at all; but it does mean that when people ask us to believe that we ought to live on bread alone, or on any particular food alone, they are probably wrong.

When we examine the diet of a fish, or a tiger, or a bird, we find that it is very limited. When we visit some zoological gardens and ask questions of the keepers, we learn that all the animals there have their particular kind of diet, and will not thrive on any other. We find, too, that the lions and tigers will not eat buns, that the sea-lions will touch nothing but fish, and so on. But *we* eat buns, and sugar, and nuts, and fish, and meat, and many other things. Now, this has a meaning. It means that man has conquered the earth, largely because he can live, and even thrive, on almost everything that Nature produces. Our organs of digestion, we know, are provided with the power of dealing with almost anything that could possibly be thought of as a food. If we study our teeth from this point of view we learn the same lesson.

THE TEETH OF ALL CREATURES ARE SUITED TO THE FOODS THEY NEED

When we look at the jaws of the horse, or the hippopotamus, or the lion, or the rabbit, we see special kinds of teeth, arranged in special ways, for a particular kind of food. It is this that makes the study of teeth so important, and especially is this so in the case of animal remains that teach us the past life of the earth, for the teeth teach us the habits of these creatures. Now, our own teeth have the great and striking character that they are suited for every kind of food. We all know the word *devour*, and the second half of it means *eat*. So we make up words like carnivorous, herbivorous, and omnivorous, which everyone should understand. *Carni* means flesh, *herbi* means herbs in general, like grass, and *omni*, of course, means all, like omnibus, which, as we read on page 4604 means " for all." Now, the teeth of most animals are adapted to either a carnivorous or herbivorous diet, or else to some other special diet, but the teeth of mankind are adapted to an omnivorous diet. So is the structure of our digestive organs. These two facts are enough in themselves to suggest that man is meant to live not by bread alone, but by every kind of good food; and the case is finally proved when we find that another natural fact about us, our appetite, points to the same thing. The sea-lion has no appetite for buns, or sugar, or nuts, or even red meat—only for fish; and the other animals have their special appetites.

THE WONDERFUL WAY IN WHICH WE ADAPT OURSELVES TO ALL KINDS OF FOOD

This puzzles the boy who expects all the animals to like all the things he likes. But the lesson is that not only his teeth and his digestive organs, but his appetite also, are omnivorous, whereas this is not the case with the other creatures. So, where the earth grows only rice, man lives and even thrives; but where it affords little but reindeer and blubber, as in the frozen North, man succeeds in living too, because of his power of adaptation. Now, this great power shows itself in another way. Just as man can live on strange and limited diets if he has to do so, so he can live on them if he chooses to do so. In America we have the choice of eating practically every single thing that the whole earth produces. We grow, or the world sends food to us, fruit and flesh, cheese and rice, and everything else. But mankind is so adaptable that, if we choose, as some of us do, to live only on raw meat and hot water, or on nuts and cheese alone, or on milk only, or on bread and a few things like it, we can do so. At first, if we suddenly change our diet, we may suffer, but after a time we adapt ourselves to the new kind of food, and are all right again. Most of us agree that when people make up their minds to live entirely on some special food, it is a "fad"; it is man's amazing power of adaptation that makes this possible.

THE GREAT IMPORTANCE OF VARIETY IN OUR FOOD

But though the possibility of these fads is deeply interesting, and though the reason why they are possible is more interesting still, yet we have not disposed of the great argument provided by our teeth, our digestive organs, and our natural appetite, that it is best for most of us to live on a *mixed diet*. The conclusion reached by all the great students of this subject is that a mixed diet is best for man, and that the fullest lives and the best work are done, on the average, by those nations and those persons who live on a mixed diet. " Variety is the spice of life," and this applies to variety in food. Further, if we take only one kind of food it is possible that we are taking too much proteid—or too little—in proportion to the other elements, or too much or too little starch or fat, and so we throw a tax on our digestive organs. If we are careful with our appetites, and use them as we should, on a mixed diet it is more likely that we shall get a suitable proportion of the various food-elements.

But men and women and children are not all the same. All our faces and all our voices are different, and these differences suggest deeper differences still, which do exist. We are not all equally adaptable. Some of us like eggs, and thrive on a diet including many eggs; but there are people to whom even a trace of egg in anything they have eaten is a real poison, and makes them seriously ill. We say, "As full as an egg is of meat," and it is true that an egg is simply crammed with fine food; but we also say truly that "One man's meat is another man's poison."

WHY DIFFERENT KINDS OF PEOPLE NEED DIFFERENT KINDS OF FOOD

So there are people who live best on a special diet, people who are happier and do better work—which means the same thing—when they take no meat, and others who are best when they take little else but meat.

Wise people find these things out for themselves. If they are very wise, they understand that what suits them does not necessarily suit other people. But though we waste a lot of time in foolish discussions about food, there are a great many questions about it which need wise discussion. Few things are more important for the life of man than the question of milk and the question of bread. Also, it is most important to remember that though the body can adapt itself to get what it needs out of a host of different foods, yet it has definite needs, as we have seen, which must be satisfied if it is to live at all.

We must have carbon in our food, but no power of adaptation, no degree of faith, no amount of practice, will enable us to use carbon in the form of diamonds or coal-dust, or to live on the nitrogen which is part of the stuff called laughing-gas. There is no system of diet which contains nothing but beef-tea or clear soup, because these are not foods, and nothing will make them foods. We ought to know these things; and we must also learn what are the foods that are cheap, what are the sham foods, that usually cost a lot of money but are not really foods at all, and what are the foods that it is risky to eat too much of, because they contain some poison—as meat, for instance, certainly does.

THE APPETITE AS A NATURAL GUIDE TO FOOD

First, however, we must understand once and for all that Nature has given us a guide, and that we are bound to take care of it. Animals think nothing about food, and yet they know everything they need to know. They have never heard of proteids, yet they are wise enough to eat what is good for them, and just as much as is good for them, when they need it, and at no other time.

That is the ideal state of things which human beings are far enough from having reached. The secret of the animal is that it has a natural and healthy appetite, that guides it from day to day. If, however, the animal is a domestic one, that lives with human beings, and that, instead of finding its own living in a state of nature, has its food provided for it by us, then we find that it eats when it is not really in need of food, eats things that are not good for it, refuses things that are good for it, and eats more than is good for it of the things that are good for it, just exactly as though it were one of ourselves.

Our difficulty is that most of us—all of us, indeed, in some measure—have changed our appetites by our habits, just as we have changed the appetites of the animals we live with. So our appetites, like theirs, can no longer be trusted.

HOW WE HAVE SPOILT OUR APPETITES BY OUR HABITS

We have all sorts of wrong notions and wrong practices. Many grown-up people think that if a child wants sugar—which *they* do not happen to want—it is greedy, and must be punished. So, of course, when the child can get sugar, of which it has been starved, it eats too much, and makes itself ill, and then we blame it.

The beginning of the trouble was that we did not trust natural appetite, and so have damaged it. Then we cook our food, and, though there are good reasons for doing that, it probably means that instead of trusting to the natural flavour of the food—which is one of the things that appetite judges by—we put in all sorts of unnatural flavours—like mustard, and pepper, and vinegar, and artificial gravies—all of which have the effect of misleading the appetite, and persuading us to eat more than is good for us of good things, or to take things which the natural appetite would not care for at all.

So I am afraid we are quite right when we are inclined not to trust our appetites; but it is we that have made them untrustworthy. I believe that it is the duty of every sensible person to keep his own appetite as natural as possible, and to take great care of the appetites of children, so that they may remain as worthy of trust as they are at first in all healthy babies and children who have been sensibly fed. Our feelings do not exist to mislead us, but to guide us. How dare we think our bodies so foolishly made that everything they tell us is deceitful? The reason why we suffer is not that we obey our feelings, but that we disobey them and cheat them.

WE SHOULD EAT ONLY WHEN HUNGRY AND DRINK ONLY WHEN THIRSTY

It is not eating when we are hungry that hurts, but tempting ourselves to eat when we are not really hungry, but merely greedy. It is not drinking when we are thirsty that hurts us, but going on drinking when we are no longer thirsty, just because the drink has a nice taste.

There are some more very important things to be said before we need study any particular foods. I am specially trying to put things in their place of right importance. Milk and the cereals are so tremendously important that they had to have special places for themselves, but after them there are no special foods nearly so important as are these general questions of appetite, and of how and when to eat.

First we must learn about cooking. So much of our food is cooked, and cooking takes up so much of our time, that we ought to know what the good of it is. One of our first reasons for cooking certain kinds of food, such as meat, is to change the look of it; we do not like it to look too red and raw. That, however, is not a particularly good reason, and, indeed, meat is not made easier to digest by being cooked. Another reason why we cook food is to soften it, and this especially applies to vegetable food. Another reason for cooking food, this time a good one, is that cooking kills the microbes in it. As regards the boiling, which is really the cooking, of milk, this is very important.

HOW WE CHEAT OUR APPETITE AND EAT MORE THAN IS GOOD FOR US

Then, also, we use cooking to cheat the appetite, and to persuade people to eat more than they really need, and that is the worst of the reasons why we cook our food. Now, the most important thing for us to know is whether cooking in general makes food better for us or worse, easier to digest or less easy. This all depends on the kind of food. A cooked egg takes much longer to digest than a raw one, and the harder it is boiled, the more difficult is it to digest. An uncooked potato, on the other hand, is all but useless to us, for the part of it which our bodies can digest is nearly all covered by tiny little coats of hard, almost woody material, which we cannot digest. Cooking bursts these coats, so that the starch inside can get out, and be used by us. When meat is cooked, the tough fibres that hold it together are loosened and softened, but the food part itself is hardened and made less digestible. If we wish to take meat in the most digestible way, we must take it raw and chop it up or else grate it. Over-cooked or twice-cooked meat is very indigestible; boiled meat is more digestible than roasted.

There is yet a great deal to learn about cooking, or, to speak more generally, about the preparation of food for eating. At present we think only of the appearance of the dish and its taste; we think almost nothing of the effects of what we do upon the digestion of the food; and we care nothing for waste.

THE IMPORTANCE OF GOOD COOKING TO A NATION'S HEALTH AND HAPPINESS

As we have seen, we are content to cook green vegetables and throw away the water, which contains all the valuable salts; and, as a rule, in cooking potatoes, we peel them and soak them, and so waste some of the most valuable of the food materials they contain. When we peel them we cut away the proteid layer just under the skin, and when we soak them a lot of useful matter goes into the water. Potatoes should either be steamed or boiled in their jackets, and the latter is vastly the better way.

So much depends upon good cooking, as regards the welfare of a nation, the health of its people, and their happiness in their homes, and so much harm is done by cooking which is either simply bad or else clever but turned to wrong uses, that the time must certainly come when this important science, and it is a science, will be taught to children of all classes. As long as the lives of men, women, and children depend upon food, the right preparation of food is a subject which is well worthy of anyone's serious study, and a queen is none the worse a queen if she can cook pastry that would not make her people ill.

The next part of this is on page 3109.

WILD FLOWERS OF CANADA. II

CONTINUED FROM PAGE 2842

BLOSSOMING at about the same time, another member of the Orchid family, Calypso borealis, is found in cool bogs and damp woods, burying its bulbs and coral-like roots in damp moss. "Even when her sanctuary is discovered Calypso does not always reveal herself. The ground and the fallen tree-trunks are thickly padded with moss and embroidered with trailing vines of snowberry and Linnaea; painted trilliums dot with their white stars the shadows lying under the tangled fragrant branches, the silence of the forest, disturbed only by the chirr of a squirrel or the sudden jubilance of the oven-bird, envelopes you and seems the proper accompaniment of such an expedition.

"You follow, perhaps, a winding path made by the wild animals among the underbrush, moving slowly, and you easily overlook the dainty blossom, nestling in some soft, damp nook and poised lightly on its stem as if ready to flutter away between your covetous fingers." The plant consists of a single thin, ovate or slightly heart-shaped leaf from a solid bulb, and a variegated pink and yellow flower with a sac-shaped, inflated lip, two-parted and bearded with yellow and pink. The flower is so exquisite that its discoverer named it after an immortal.

THE LADY'S SLIPPERS

The charm of the Lady's Slipper never wanes. There are several species. One of the earliest, the Stemless or Pink Lady's Slipper, is found under hemlocks and pines in early June.

"Graceful and tall the slender, drooping stem,
With two broad leaves below,
Shapely the flower so lightly poised between,
And warm her rosy glow."

There are two large, oval, veiny leaves lying close to the moss and sheathing the base of a scape, eight to twelve inches high, bearing at its top a solitary pink flower with a veiny lip, and inflated pouch. In all species of Cypripedium (Lady's Slipper), the lip is swollen and sac-like, forming a nectary. The column is unlike that of the other Orchids. The single anther, usually present, is sterile, and forms a flap which overhangs the stigma. Two fertile anthers are attached to the under side of the column. The flower is fertilised by the common bumblebee, which forces its way in through the fissure in front. After eating, he takes the easiest way out, towards the base, where he can see two spots of light. As he forces his way out the pollen on his back is rubbed off by the sticky stigma. As he struggles out of the flower, an anther, which blocks the passage, clasps its load of pollen on his back, and this is carried to another flower, where the whole process is repeated. Thus cross-pollination of flowers is ensured and self-pollination is rendered impossible. Six other species of Lady's Slipper have been observed in Canada.

The Yellow Lady's Slipper blossoms a few days later than its pink sister. The leaves are alternate, broadly oval, many veined, and plaited. The stem is two feet high, downy, leafy to the top and one to three-flowered. The flower is large, with a pale yellow lip forming an inflated pouch, and two long, narrow, wavy, brownish, lateral petals which give the flower an alert, startled look when surprised in its lonely hiding places. The Showy Lady's Slipper is usually regarded as the most beautiful of all. The flowers are large and white, with the much inflated lip, about two inches long, pink in front. The stem is leafy, one to

Copyright, 1913, by M. Perry Mills.

two feet high, and bears at its summit the solitary blossom. It is found in rich woods during June and July.

Two Yellow Lady's Slippers blossom from May to July. The Small Yellow Lady's Slipper grows in swamps from Ontario to the Rocky Mountains. It bears "golden slippers meet for fairies' feet." The flower is fragrant and graceful, and has a deep-yellow sac and reddish-brown sepals and petals. The Ram's-head Lady's Slipper occurs in cedar and tamarac swamps, but is not common. It bears three or four leaves at the base of a low stem, and a solitary, purplish, drooping flower, with projecting horns and ears, and a tuft of wool at the top.

SOME OTHER ORCHIDS

The lovely Arethusa or Indian Pink, another Orchid, is common in marshes in June. The flower is rose-purple and large, with a bearded lip. The one-flowered stem grows from a globular bulb, and is sheathed at its base by a solitary, linear leaf, hidden in the sheaths of the stem and protruding after flowering. Burroughs writes: "Arethusa was one of the nymphs who attended Diana, and was by that goddess turned into a fountain that she might escape the god of the river Alpheus, who became desperately in love with her on seeing her at the bath." Our Arethusa is one of the prettiest of the orchids, and has been pursued through many a marsh and quaking-bog by her lovers. She is a bright pink-purple flower, an inch or more long, with the odour of sweet violets.

Sweet Pogonia is another rare but beautiful orchid. It has rosy blossoms, and a perfume suggesting ripe red raspberries. The stem is about eight inches high and bears a single ovate or lance-shaped leaf near the middle, and a solitary flower at the summit.

The beautiful Calopogon or Grass Pink is a lovely orchid, with a loose raceme of four to twelve delicate, pink flowers in a loose cluster at the top of a scape six to twelve inches high. The flowers seem to be upside down, as the tip is at the top. A single grass-like leaf sheathes the stem near its base, as it rises from a solid bulb in deep swamps and bogs.

The Purple Fringed Orchid is found in wet meadows in early June. A smaller species appears in July. The lower leaves are oval or oblong, passing into lance-shaped bracts above. The flowers are purple, rather large, and grow in a spike. Each flower has a fan-shaped, three-parted lip with fringed divisions, and a long curving spur. Under date of June 9th, Thoreau writes: "Find the great fringed orchid out apparently two or three days — a large spike of peculiarly delicate, pale-purple flowers growing in the luxuriant and shady swamp — the village belle never sees this more delicate belle of the swamp — only the skunk or owl or other inhabitants of the swamp behold it."

THE MONUMENT CHOSEN BY LINNAEUS

The Twin Flower belongs to the Honeysuckle family.

"... Beneath dim aisles, in odorous
 beds,
The slight Linnaea hangs its twin-born
 heads."

It has a slender, creeping and trailing stem, and rounded, evergreen leaves. The delicate, pink, fragrant flowers grow in pairs, nodding on threadlike, upright flower-stems. The calyx is five-toothed, and the corolla bell-shaped and five-lobed, and hairy within. The delicious perfume of the nodding pink flowers fills the air and draws one to their home in the cool moss of the woods. The great Linnaeus selected this little plant as his monument and named it Linnaea borealis.

Another pretty flower of June woods is Bunch-berry or Pigeon-berry. It has a stem five to seven inches high, and ovate pointed leaves, which are crowded into a whorl of four to six. At first sight, the flowers appear like a single white blossom, but on closer inspection it is found that what appeared like white, round petals are really the white leaves of the involucre which surrounds a cluster or head of small, greenish flowers. The fruit is bright-red and berry-like, and lends beauty to the woods and swamps in late summer. They are edible, and form part of the winter food of denizens of the northern woods of Canada.

"Born in the purple, born to joy and
pleasance
Thou dost not toil or spin,
But makest glad and radiant with thy
presence
The meadow and the lin."

THE REGAL FLEUR-DE-LIS, THE FLOWER OF CHIVALRY

The Large Blue Flag or Fleur-de-lis is beautiful in form and colour. The Fleur-de-lis, the "flower of chivalry" chosen by Louis VII as his badge, was the White Iris, which is even more regal and beautiful than the blue species. The latter species has a solitary flower from a green spathe, at the end of a long stem. The flower is large and showy, violet-blue, variegated with green, yellow or white, and purple-veined. The perianth consists of three outer recurved divisions, and three inner smaller and erect parts. The three stamens are covered by the three over-arching, petal-like divisions of the style. The foliage leaves are flat and sword-shaped, green, and are folded into flat clusters at the base. The stem is one to three feet high, stout, angled on one side, and leafy. It abounds in wet meadows and ditches, and the flowers appear in June. The Blue Flag flower possesses a special interest to the botanist because it is an example of a flower which has guarded itself against self-fertilisation. The divisions of the style over-arch the stamens, and this arrangement effectually prevents self-pollination. Bees carry pollen from one flower to another. It is said that bees like blue flowers. The insect lights on one of the recurving sepals, and, guided by the conspicuous veins, thrusts his head and back beneath a branch of the style and sips the honey at the base of the stamens. The pollen is sifted on his back. In withdrawing he leaves the stigma of that flower untouched, but the projecting lip of the stigma of the next flower visited scrapes his back and thus secures the needed pollen.

The Blue-eyed Grass blossoms in June, and belongs to the Iris family. The plant is about one foot high with narrow, grass-like leaves, and small blue flowers with a yellow centre. The flowers open in the morning but close later in the day. It is common in meadows from Atlantic to Pacific.

ANOTHER PURPLE FLOWER

The Fringed Polygala is a delicate and lovely flower blossoming in early June. It prefers a sandy soil in rich woods and is found in Eastern and Middle Canada. The stem is three or four inches high, from long prostrate or underground stems. The upper leaves are green, ovate and crowded at the summit; the lower leaves are scattered and scale-like. The whole plant has a fresh and tender aspect. It has large, showy, purplish flowers, rarely white, with corollas which are conspicuously fringed and crested. In addition to these showy blossoms the plant bears small hidden flowers on its underground stems — "one playful flower for the world, another for serious use and posterity."

In June woods the much-divided leaf and rounded flower-clusters of Wild Sarsaparilla are often seen, and later in the year the dark berries are noticeable. The stem bears a single, large, long-petioled, much-divided leaf, and a shorter naked scape which bears the rounded flower-cluster of small greenish-white flowers. The long roots are fragrant and aromatic, and are often sold as a substitute for genuine Sarsaparilla.

THE GERANIUMS

Wild Geranium is a common woodland plant flowering in early summer. The stem is erect and one to two feet high, and the leaves are rough-hairy. The leaves are five-parted, with the divisions lobed and cut. The flowers are quite large, magenta or pale-purple, and grow in clusters at the ends of the branches. The corolla is regular, with five petals. The calyx is hairy and has five sepals. The beak-like appearance of the fruit, which splits at maturity so elastically as to discharge the seeds to some distance, gives the common name Cranesbill. Geranium is the Greek word for Crane.

Herb Robert is another geranium very similar to the last, but smaller. Its leaves are smaller and more deeply cleft, and the flowers are coarser in texture. The stem is usually stained with red, and both stem and leaves emit a strong odour when bruised.

THE SORREL, SOMETIMES CALLED THE SHAMROCK

Wood Sorrel belongs to the same family. Sorrel is from the German word Sour, and has reference to the acrid juice of sorrels. The White Wood Sorrel makes a dainty carpeting in June woods. The flowers are frail looking, about one inch broad, with five white petals veined with red, and are solitary on little scapes two to five inches high. The leaves are divided into three clover-like leaflets which "sleep" at night — that is, they droop and close one against another. The early Italian painters used it as a model. Ruskin says: "Fra Angelico's use of the Oxalis Acetosella is as faithful in representation as touching in feeling. The triple leaf of the plant and white flower stained purple probably gave it strange typical interest among the Christian painters."

By many the three-parted leaf has been considered the shamrock of the ancient Irish, and that its three-divided leaf was used by Saint Patrick in his endeavour to prove to his audience the possibility of a Trinity in unity. "Cuckoo meat" and "Cuckoo bread" are English names for the flower because it comes with the Cuckoo; and the odd name "Alleluia" given it in Europe, recognises its advent near the glad Easter season. The Yellow Wood Sorrel has fragrant bright, golden-yellow flowers. It is not a woodland plant but is common along roadsides, and in gardens and fields, from Nova Scotia to Manitoba. The stem is leafy and slender, and the flowers, which open only in the sunshine, are in few-flowered clusters at the end of the stem. After the flowering season, little, erect, pointed pods take the place of the flowers.

FLOWERS THAT LIVE THROUGH THE YEAR

The Partridge Vine is an evergreen vine clothed with dark, shining, rounded green leaves, which are often veined with white. At all times of the year this pretty trailing vine, with its little evergreen leaves, adorns the moist woods and woodside banks in Eastern Canada. The little cream-white flowers appear in June and July, and are succeeded later by bright red berries which, though nearly tasteless, are much liked by birds. The unmolested berries remain on until the following spring, when they may be found among the waxy flowers.

THE DAINTY LITTLE WINTERGREEN

The Wintergreen or Checkerberry is a much prized little evergreen found in the cool shade of evergreen woods. The stem is three to six inches high, slender and leafy at the summit. The leaves are oval, about one inch broad, sparingly toothed, shining green, evergreen, and edible. The delicate little white flowers are urn-shaped, with the corolla five-toothed, and they usually hang in twos on slender peduncles, just beneath the spreading leaves. The flowers are delicate and pretty, with a background of shining leaves. The leaves have a pleasant aromatic flavour, similar to that of sweet birch, and are sometimes used as a substitute for tea. The bright red berries are also edible and savoury, and are relished by birds and deer during the winter.

TWO UNPLEASANT FLOWERS

The Indian Poke or False Hellebore is a plant which attracts attention in early spring and summer, not because of its dingy flowers, which appear in June, but because of its tall stems, two to seven feet high, clothed with many large broadly-oval, pointed, clasping leaves. The root is coarse, fibrous and poisonous. It grows in swampy woods and roadsides.

Somewhat similar in name, but quite different in form, is Indian Pipe, another dweller in deep woods. It is a low, fleshy herb three to eight inches high, without green foliage, but with colourless bracts in the place of leaves.

"In shining groups, each stem a pearly
ray,
Weird flecks of light within the shadowed
wood,
They dwell aloof, a spotless sisterhood.
No Angelus, except the wild bird's lay,

Awakes these forest nuns; yet, night and day
Their heads are bent, as if in prayerful mood.
A touch will mar their snow, and tempests rude
Defile; but in the mist fresh blossoms stray
From spirit-gardens, just beyond our ken."

The flower is white or pinkish, single, terminal, and nodding — the bowl of the pipe. The plants spring from a ball of matted rootlets which are parasitic on decaying vegetable matter. The clammy touch of the plant, its waxlike whiteness in life, and its disposition to decompose and turn black when plucked and handled, make the name "Corpse plant" seem singularly appropriate. The Indians used it as an eye lotion.

BEECHDROPS AND CUCUMBER-ROOT

Beechdrops or Cancer-root is another fleshy, parasitic plant of northern woods. These curious looking plants have slender, branching fleshy stems, purplish or yellowish in colour, without leaves but covered with small scales. The flowers are purplish or yellowish, small, and of two kinds, the upper sterile and the lower fertile. The Pine Sap or False Beechdrops is another parasitic plant very similar to the true Beechdrops, found from June to August in oak or pine woods. It is tawny, reddish, or whitish. The flowers are clustered and fragrant.

The Indian Cucumber-root is found in deep woods, has a tuberous rootstock, which in shape and flavour resembles a cucumber, and was probably used as food by the Indians. The stem is slender, from one to three feet high, with leaves in two whorls, the lower whorl of five to nine oblong pointed leaves set close to the stem, the upper whorl of three or four much smaller leaves. The flowers are greenish-yellow, small, clustered, and set close to the upper leaves. In September, the brilliant foliage and purple berries of the little plant attract attention.

Leaving the forest, and approaching the bank of a fresh water stream or shallow pond, one's attention is attracted by the blue, closely-spiked flowers of Pickerel-weed, which blossoms from July to September. The stem is stout and usually one-leaved. The leaf is arrow or heart-shaped, and clasps the stem about midway, while others on long petioles grow from the rootstock. One may fish for pickerel in the shallow water where Pickerel-weed grows.

THE GORGEOUS FLAME BESIDE THE BROOK

I close this description of common Canadian wild flowers which blossom in spring or early summer by a reference to one of the most attractive of all.

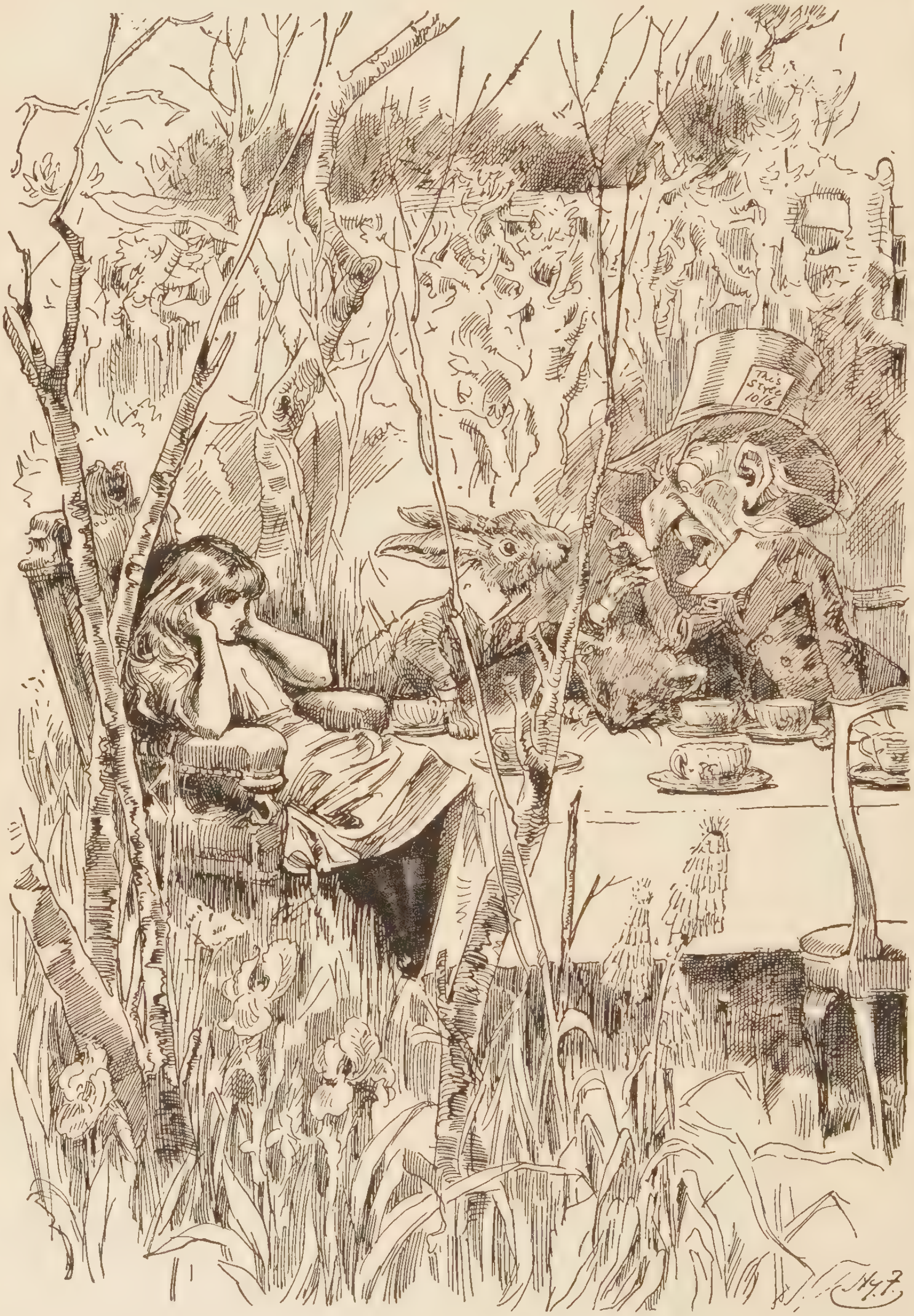
"As if some wounded eagle's breast
Slow throbbing o'er the plain,
Had left its airy path impressed
With scarlet rain."

The early French Canadians were so impressed with the beauty of the Cardinal-flower that they sent the plant to France as a specimen of what the wilds of the New World could produce. In late summer its brilliant red gleams from marshes and moist ground along brooks, from Nova Scotia to Manitoba. The stem is two to four feet high, and hollow. The leaves are alternate, narrowly oblong or lance-shaped and closely set to the stem. The showy spike is loosely set with bright red flowers. The corolla is somewhat two-lipped, the upper lip of two erect lobes, the lower lip spreading and three-cleft. The flowers are frequently visited by and chiefly fertilised by the Ruby-throated Humming-bird. The English name likens it to the gorgeously attired dignitaries of the Roman Church.

When one has come upon a brook or a marsh glowing with this gorgeous flame he can never forget the sight. No flower of the greenhouse or the garden can surpass these proud plants which swing in the breezes like moving flames among the green.

"Earth's crammed with heaven,
And every common bush afire with God;
But only he who sees takes off his boots."

THE COMPANY AT THE MAD TEA-PARTY



ALICE WITH THE MARCH HARE, THE MAD HATTER, AND THE SLEEPING DORMOUSE

There was a table set out under a tree, and the March Hare and the Hatter were having tea at it; a dormouse was sitting between them fast asleep, and the other two were using it as a cushion, resting their elbows on it, and talking over its head. "No room! No room!" they cried out when they saw Alice coming. "There's *plenty* of room!" said Alice indignantly. And she sat down in a large armchair at one end of the table.

ALICE'S ADVENTURES IN WONDERLAND

HERE we follow Alice further in her many and strange adventures in Wonderland. It will be remembered that she had just escaped from the house of the White Rabbit, after having eaten the little cakes which made her so tiny that she could get through the very little door of the house. She then ran into a thick wood where she would be safe until she could decide what she would next attempt to do, for she was only three inches high now, and wished to grow a bit! What happened after this is told in the following pages.

THE MAD TEA-PARTY

CONTINUED FROM 2939

ONCE in the wood she was anxious to get back to her right size again, and then to get into that lovely garden. But how? Just then she saw an enormous puppy looking down at her from among the trees. She held up a stick for it to catch, and the next moment it was playing with great delight; but as Alice was so small and the puppy so large, she was in danger of getting hurt by it, so she escaped when it was out of breath. If she could only get something to eat or drink, she was sure something would happen to her. Peeping over a mushroom, she beheld a large blue caterpillar sitting on the top with its arms folded, quietly smoking a long hookah, and taking not the smallest notice of her or of anything else. At length, in a sleepy sort of way, it began talking to her, and she told it what she wanted so much—to grow to her right size again.

"I should like to be a *little* longer," she said. "Three inches is such a wretched height to be."

"It is a very good height indeed," said the Caterpillar angrily, rearing itself upright as it spoke (it was exactly three inches high).

"But I'm not used to it," pleaded poor Alice in a piteous tone. And she thought to herself: "I wish the creatures wouldn't be so easily offended."

"You'll get used to it in time," said the Caterpillar; and it put the hookah into its mouth and began smoking again.

This time Alice waited patiently until it chose to speak again. In a minute or two the Caterpillar took the hookah out of its mouth and yawned once or twice, and shook itself. Then it got down off the mushroom, and crawled away into the grass, merely remarking as it went: "One side will make you grow taller, and the other side will make you grow shorter."

"One side of *what?* The other side of *what?*" thought Alice to herself.

"Of the mushroom," said the Caterpillar, just as if she had asked it aloud; and in another moment it was out of sight.

Alice remained looking thoughtfully at the mushroom for a minute, trying to make out which were the two sides of it; and as it was perfectly round, she found this a very difficult question. However, at last she stretched her arms round it as far as they would go, and broke off a bit of the edge with each hand.

"And now which is which?" she said to herself, and nibbled a little of the right-hand bit to try the effect. The next moment she felt a violent blow underneath her chin; it had struck her foot!

She was a good deal frightened by this very sudden change, but she felt that there was no time to be lost, as she was shrinking rapidly; so she set to work at once to eat some of the other bit. Her chin was pressed so closely against her foot that there was hardly room to open her mouth; but she did it at last, and managed to swallow a morsel of the left-hand bit.

The next minute she had grown so tall that her neck rose like a stalk out of a sea of green leaves, and these green leaves were the trees of the wood. A pigeon attacked her, calling her a serpent, and no wonder, with such a neck. But by nibbling bits of mushroom she at last succeeded in bringing herself down to her usual height. But, oh dear, in order to get into the first house she saw, she had to eat some more of the mushroom from her right hand and bring herself down to nine inches. Outside the house she saw the Fish-footmen and the Frog-footmen with invitations from the Queen to the Duchess, asking her to play croquet. The Duchess lived in the house, and a terrible noise was going on inside, and when the door was opened a plate came crashing out. But Alice got in at last, and found a strange state of things. The Duchess and her cook were quarrelling because there was too much pepper in the soup. The cook threw everything she could lay hands on at the Duchess, and nearly knocked the baby's nose off with a saucepan.

The Duchess had the baby in her lap, and tossed it about ridiculously, finally throwing it in the most heartless way to Alice, and telling her she could nurse it if she liked. She took it out of doors, and, behold, it turned into a little pig, jumped out of her arms and ran away into the wood.

" If it had grown up," she said, " it would have made a dreadfully ugly child ; but it makes rather a handsome pig, I think."

She was a little startled now by seeing the Cheshire Cat—which she had first seen in the house of the Duchess—sitting on a bough of a tree a few yards off. The Cat only grinned when it saw Alice. It looked good-natured, she

THE LAZY BLUE CATERPILLAR TELLING ALICE ABOUT THE MUSHROOM

In a minute or two the Caterpillar took the hookah out of its mouth and yawned once or twice, and shook itself. As it got down off the mushroom, it merely remarked : " One side will make you grow taller, and the other side will make you grow shorter." " One side of *what ?* The other side of *what ?*" thought Alice to herself. " Of the mushroom," said the Caterpillar, just as if she had asked it aloud. But how was she to tell one side from the other ?

thought; still, it had *very* long claws and a great many teeth, so she felt that it ought to be treated with respect.

"Cheshire Puss," she began rather timidly, as she did not at all know whether it would like the name; however, it only grinned a little wider. "Come, it's pleased so far," thought Alice, and she went on: "Would you tell me, please, which way I ought to walk from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where——" said Alice.

"Then it doesn't matter which way you walk," said the Cat.

"So long as I get *somewhere*" Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, "if you only walk long enough!"

Alice felt that this could not be denied, so she tried another question.

"What sort of people live about here?"

"In *that* direction," the Cat said, waving its right paw round, "lives a hatter; and in *that* direction,"—waving the other paw—"lives a March hare. Visit either you like; they're both mad."

"But I don't want to go among mad people," Alice remarked.

"Oh, you can't help that," said the Cat; "we're all mad here! I'm mad. You're mad."

"How do you know I'm mad?" said Alice.

"You must be," said the Cat, "or you wouldn't have come here."

Alice didn't think that proved it at all; however, she went on: "And how do you know that you're mad?"

"To begin with," said the Cat, "a dog's not mad. You grant that?"

"I suppose so," said Alice.

"Well, then," the Cat went on, "you see, a dog growls when it's angry, and wags its tail when it's pleased. Now, *I* growl when I'm pleased, and wag my tail when I'm angry. Therefore I'm mad."

"*I* call it purring, not growling," said Alice.

"Call it what you like," said the Cat. "Do you play croquet with the Queen to-day?"

"I should like it very much," said Alice, "but I haven't been invited yet."

"Cheshire Puss," Alice began rather timidly, "would you tell me, please, which way I ought to walk from here?" "That depends a good deal on where you want to get to," said the Cat, which was grinning strangely.

"You'll see me there," said the Cat, and vanished. . . . Alice waited a little, half expecting to see it again, but it did not appear, and after a minute or two she walked on in the direction in which the March Hare was said to live.

"I've seen hatters before," she said to herself; "the March Hare will be much the most interesting, and perhaps as this is May it won't be raving mad—at least, not so mad as it was in March." As she said this, she looked up, and there was the Cat again, sitting on a branch of a tree.

"Did you say pig, or fig?" said the Cat.

"I said pig," replied Alice; "and I wish you wouldn't keep appearing and vanishing so suddenly; you make one quite giddy."

"All right," said the Cat; and this time it vanished quite slowly, beginning with the end of the tail, and ending with the grin, which remained some time after the rest of it had gone.

"Well, I've often seen a cat without a grin," thought Alice; "but a grin without a cat! It's the most curious thing I ever saw in all my life."

She had not gone much farther before she came in sight of the house of the March Hare; she thought it must be the right house, because the chimneys were shaped like ears and the roof was thatched with fur. It was so large a house that she did not like to go nearer till she had nibbled some more of the left-hand bit of mushroom, and raised herself to about two feet high; even then she walked up towards it rather timidly, saying to herself: "Suppose it should be raving mad after all. I almost wish I'd gone to see the Hatter instead."

There was a table set out under a tree in front of the house, and the March Hare and the Hatter were having tea at it; a dormouse was sitting between them fast asleep, and the other two were using it as a cushion, resting their elbows on it, and talking over its head.

"Very uncomfortable for the Dormouse," thought Alice; "only, as it's asleep, I suppose it doesn't mind."

The table was a large one, but the three were all crowded together at one corner of it.

"No room! No room!" they cried out when they saw Alice coming.

"There's *plenty* of room!" said Alice indignantly. And she sat down in a large armchair at one end of the table.

"Have some wine," the March Hare said, in an encouraging tone.

Alice looked all round the table, but there was nothing on it but tea.

"I don't see any wine," she remarked.

"There isn't any," said the March Hare.

"Then it wasn't very civil of you to offer it," said Alice angrily.

"It wasn't very civil of you to sit down without being invited," said the March Hare.

"I didn't know it was *your* table," said Alice; "it's laid for a great many more than three."

"Your hair wants cutting," said the Hatter.

He had been looking at Alice for some time with great curiosity, and this was his first speech.

"You should learn not to make personal remarks," Alice said, with some severity; "it's very rude."

The Hatter opened his eyes very wide on hearing this, but all he *said* was:

"Why is a raven like a writing-desk?"

"Come, we shall have some fun now," thought Alice. "I'm glad they've begun asking riddles. I believe I can guess that," she added aloud.

"Do you mean that you think you can find out the answer to it?" said the March Hare.

"Exactly so," said Alice.

"Then you should say what you mean," the March Hare went on.

"I do," Alice hastily replied; "at least—at least, I mean what I say. That's the same thing, you know."

"Not the same thing a bit," said the Hatter. "Why, you might just as well say that 'I see what I eat' is the same thing as 'I eat what I see.'"

"You might just as well say," added the March Hare, "that 'I like what I get' is the same thing as 'I get what I like.'"

"You might just as well say," added the Dormouse, who seemed to be talking in his sleep, "that 'I breathe when I sleep' is the same thing as 'I sleep when I breathe.'"

"It *is* the same thing with you," said the Hatter; and here the conversation dropped, and the party sat silent for a minute, while Alice thought over all she could remember about ravens and writing-desks, which wasn't much.

The Hatter was the first to break the silence.

"What day of the month is it?" he said, turning to Alice.

He had taken his watch out of his pocket and was looking at it uneasily, shaking it every now and then, and holding it to his ear.

Alice considered a little, and said:

"The fourth."

"Two days wrong," sighed the Hatter. "I told you butter wouldn't suit the works," he added, looking angrily at the March Hare.

"It was the *best* butter," the March Hare meekly replied.

"Yes, but some crumbs must have got in as well," the Hatter grumbled. "You shouldn't have put it in with the bread-knife."

The March Hare took the watch and looked at it gloomily; then he dipped it into his cup of tea, and looked at it again, but he could think of nothing better to say than his first remark: "It was the *best* butter, you know."

Alice had been looking over his shoulder with some curiosity.

The March Hare took the watch and looked at it gloomily; then he dipped it into his cup of tea, and looked at it again, but he could think of nothing better to say than his first remark: "It was the *best* butter, you know."

"What a funny watch!" she remarked. "It tells the day of the month, and doesn't tell what o'clock it is."

"Why should it?" muttered the Hatter. "Does your watch tell you what year it is?"

"Of course not," Alice replied very readily; "but that's because it stays the same year for such a long time together."

"Which is just the case with *mine*," said the Hatter.

Alice felt dreadfully puzzled. The Hatter's remark seemed to her to have no sort of meaning in it, and yet it was certainly English.

"I don't quite understand you," she said, as politely as she could.

"The Dormouse is asleep again," said the Hatter; and he poured a little hot tea on to its nose.

The Dormouse shook its head impatiently, and said, without opening its eyes:

"Of course, of course. Just what I was going to remark myself."

"Have you guessed the riddle yet?" the Hatter said.

"No, I give it up," Alice replied. "What's the answer?"

"I haven't the slightest idea," said the Hatter.

"Nor I," said the March Hare.

Alice sighed wearily.

"I think you might do something better with the time," she said, "than wasting it in asking riddles that have no answers."

"If you knew Time as well as I do," said the Hatter, "you wouldn't talk about wasting *it*. It's *him*."

"I don't know what you mean," said Alice.

"Of course you don't," the Hatter said, tossing his head contemptuously. "I dare say you never even spoke to Time."

"Perhaps not," Alice cautiously replied; "but I know I have to beat time when I learn music."

"Ah, that accounts for it!" said the Hatter. "He won't stand beating. Now, if you only kept on good terms with him, he'd do almost anything you liked with the clock. For instance, suppose it were nine o'clock in the morning, just time to begin lessons: you'd only have to whisper a hint to Time, and round goes the clock in a twinkling. Half-past one, time for dinner!"

"I only wish it was," the March Hare said to himself in a whisper.

"That would be grand, certainly," said Alice thoughtfully; "but, then—I shouldn't be hungry for it, you know."

"Not at first, perhaps," said the Hatter; "but you could keep it to half-past one as long as you liked."

"Is that the way *you* manage?" Alice asked.

The Hatter shook his head mournfully. "Not I!" he replied. "We quarrelled last March—just before *he* went mad, you know" (pointing with his teaspoon at the March Hare). "It was at the great concert given by the Queen of Hearts, and I had to sing:

'Twinkle, twinkle, little bat!
How I wonder what you're at!'

You know the song, perhaps?"

"I've heard something like it," said Alice.

"It goes on, you know," the Hatter continued, "in this way:

'Up above the world you fly,
Like a tea-tray in the sky.
Twinkle, twinkle—'"

Here the Dormouse shook itself, and began singing in its sleep: "*Twinkle, twinkle, twinkle, twinkle*——" and went on so long that they had to pinch it to make it stop.

"Well, I'd hardly finished the first verse," said the Hatter, "when the Queen bawled out, 'He's murdering the time! Off with his head!'"

"How dreadfully savage!" exclaimed Alice.

"And ever since that," the Hatter went on in a mournful tone, "he won't do a thing I ask. It's always six o'clock now."

A bright idea came into Alice's head. "Is that the reason so many tea-things are put out here?" she asked.

"Yes, that's it," said the Hatter with a sigh; "it's always tea-time, and we've no time to wash the things between whiles."

"Then you keep moving round, I suppose?" said Alice.

"Exactly so," said the Hatter; "as the things get used up."

"But when you come to the beginning again?" Alice ventured to ask.

"Suppose we change the subject," the March Hare interrupted, yawning. "I'm getting tired of this. I vote the young lady tells us a story."

"I'm afraid I don't know one," said Alice, rather alarmed at the proposal.

"Then the Dormouse shall!" they both cried. "Wake up, Dormouse!" And they pinched it on both sides at once.

The Dormouse slowly opened its eyes. "I wasn't asleep," it said, in a hoarse, feeble voice. "I heard every word you fellows were saying."

"Tell us a story," said the March Hare.

"Yes, please do!" pleaded Alice.

"And be quick about it," added the Hatter, "or you'll be asleep again before it's done."

"Once upon a time there were three little sisters," the Dormouse began in a great hurry; "and their names were Elsie, Lacie, and Tillie; and they lived at the bottom of a well——"

"What did they live on?" said Alice, who always took a great interest in questions of eating and drinking.

"They lived on treacle," said the Dormouse, after thinking a minute or two.

"They couldn't have done that, you know," Alice gently remarked; "they'd have been ill."

"So they were," said the Dormouse; "*very* ill."

Alice tried a little to fancy to herself what such an extraordinary way of living would be like, but it puzzled her too much, so she went on: "But why did they live at the bottom of a well?"

The Mad Hatter singing "Twinkle, twinkle, little bat!"

"Take some more tea," the March Hare said to Alice very earnestly.

"I've had nothing yet," Alice replied in an offended tone, "so I can't take more."

"You mean you can't take *less*," said the Hatter. "It's very easy to take *more* than nothing."

"Nobody asked *your* opinion," said Alice.

"Who's making personal remarks now?" the Hatter asked triumphantly.

Alice did not quite know what to say to this, so she helped herself to some

THE DORMOUSE FALLS ASLEEP TELLING ITS STORY

The Dormouse had closed its eyes while telling its very absurd story, and was going off into a doze; but, on being pinched by the Hatter, it woke up again, and continued its tale, though it never got to the end of it.

tea and bread and butter, and then turned to the Dormouse and repeated her question: "Why did they live at the bottom of a well?"

The Dormouse again took a minute or two to think about it, and then said: "It was a treacle-well."

"There's no such thing," Alice was beginning very angrily, but the Hatter and the March Hare went "Sh! sh!" and the Dormouse sulkily remarked: "If you can't be civil, you'd better finish the story for yourself."

"No, please go on," Alice said very humbly; "I won't interrupt you again. I dare say there may be *one*."

"One, indeed!" said the Dormouse indignantly. However, it consented to go on. "And so these three little sisters—they were learning to draw, you know——"

"What did they draw?" said Alice, quite forgetting her promise.

"Treacle," said the Dormouse, without considering at all this time.

"I want a clean cup," interrupted the Hatter. "Let's all move one place on." He moved on as he spoke, and the Dormouse followed him; the March Hare moved into the Dormouse's place, and Alice rather unwillingly took the place of the March Hare.

The Hatter was the only one who got any advantage from the change, and Alice was a good deal worse off than before, as the March Hare had just upset the milk-jug into his plate. Alice did not wish to offend the Dormouse again, so she began very cautiously: "But I don't understand. Where did they draw the treacle from?"

"You can draw water out of a water-well," said the Hatter; "so I should think you could draw treacle out of a treacle-well—eh, stupid?"

"But they were *in* the well," Alice said to the Dormouse, not choosing to notice this last remark.

"Of course they were," said the Dormouse—"well in."

This answer so confused poor Alice

that she let the Dormouse go on for some time without interrupting it.

"They were learning to draw," the Dormouse went on, yawning and rubbing its eyes, for it was getting very sleepy; "and they drew all manner of things—everything that begins with an M——"

"Why with an M ?" said Alice.

"Why not ?" said the March Hare.

Alice was silent.

The Dormouse had closed its eyes by this time, and was going off into a doze; but, on being pinched by the Hatter, it woke up again with a little shriek, and went on: "——that begins with an M, such as mouse-traps, and the moon, and memory, and muchness—you know you say things are 'much of a muchness'—did you ever see such a thing as a drawing of a muchness ?"

"Really, now you ask me," said Alice, confused, "I don't think——"

"Then you shouldn't talk," said the Hatter.

This piece of rudeness was more than Alice could bear; she got up in disgust, and walked off. The Dormouse fell asleep instantly, and neither of the others took the least notice of her going, though she looked back once or twice, half hoping that they would call after her.

The last time she saw them, they were trying to put the Dormouse into the teapot.

"At any rate, I'll never go *there* again," said Alice, as she picked her way through the wood. "It's the stupidest tea-party I ever was at in all my life."

. . . .

What happened after Alice got away from the Mad Tea-Party, and the other adventures that befell her before the end of her story, are told on page 3115.

THE FABLES OF ÆSOP THE SLAVE

THE OLD MAN AND HIS SONS

An old man had three sons, who were always quarelling with one another. The father often tried to reconcile them, and told them how foolish it was to quarrel; but his advice had no effect upon them.

So one day he called his three sons and gave them a bundle of firewood, telling them each to try if with all their might and strength they could break the bundle of sticks into two pieces. Each one tried without success, for the sticks were so closely and tightly bound together that no man's strength was sufficient to break them.

Then the father untied the bundle, and told his sons to break the sticks one by one, which they were able to do quite easily. Then he said to them:

"See, boys, how important it is to keep together. When you are united in the bonds of friendship, no one can hurt you; but if you quarrel and separate, people will be able to injure you."

Union is strength.

THE CRAB AND HER MOTHER

Everyone who has been to the seaside, and has watched the little crabs in the rock pools, will have noticed that they generally walk sideways. It is said that once upon a time a mother crab scolded her daughter for walking sideways, pointing out that it looked very awkward, and was quite unlike the way the rest of the world walked.

"Indeed, mother," replied the young crab, "I walk as well as ever I can; but if you would like me to do it in a different way, I wish you would set me an example, and show me the proper way to walk, because I have always noticed that you walk sideways yourself."

Example is better than precept.

THE TORTOISE AND THE EAGLE

A tortoise, who had grown tired of crawling about on the ground, and wanted to see the world, published a notice that if any bird would take him up into the air and show him the world, he would reward him by giving to him a number of precious stones which he knew were hidden in a certain place in the ground.

The eagle undertook to do as he wished, and carried the tortoise high up in the air to look round. Then he asked him to tell him where the precious stones were hidden, but the tortoise, who had never seen any precious stones, of course could not keep his promise, so the eagle dropped him, and he was dashed to pieces on the rocks far below.

People who do not keep their promises are sure to suffer for it sooner or later.

THE NEXT STORIES BEGIN ON PAGE 3115

THE NEW WOMAN

It is only during the last century that women have entered the professions or gone into business. Among our grandmothers it was an unheard-of thing for a woman of good family to earn her own living. If her husband died, or if she were a spinster with no money of her own, she was taken care of by the next of kin in the masculine line, or scraped together a scanty living doing embroidery or some other "ladylike tasks." It never even occurred to her that she could fit herself for work out of the home like her brothers, and enter public life or the professions or business and win her way on an equal footing with them. Such a suggestion would have been met with exclamations of horror as something truly impossible and unfeminine.

CHANGING CONDITIONS

How different conditions are today! Girls go to college with their brothers, take their degrees and sally forth into the world to struggle for themselves, if not on quite an equal footing with men, yet every day more and more attaining that end. It is the age of "working women."

And yet such a state of affairs did not come about suddenly, nor is it wholly the result of women's discontent with domestic life. It is rather more the outgrowth of the times, — the natural evolution of womankind in the history of the race. The increased cost of living, and the higher standard required of young men entering the professional and business life, and the consequent necessity for prolonging the period devoted to preparation for that life, are heavy factors in the movement. That nine women out of ten would prefer marriage and the making of a home for themselves, to success in any profession, is just as much of a truth today as it was a hundred years ago. But the first ten years of a man's career are necessarily devoted merely to establishing himself in his business, and the average young man of today cannot afford to get married until he is nearing the thirties, and many can never marry.

AN EXPANDING WORLD

In the meantime what has the girl been doing? Going to college, broadening her outlook, preparing also to enter a profession. Naturally quick and receptive, she is ready to earn her own living, as soon as her brother, perhaps earlier. She becomes absorbed in her work, and she too learns what it means to feel the joy of "winning out," of making herself and her personality felt in the world; and she experiences the sense of freedom that comes from handling her own money, for which she has to account to no one. Her outlook on life has been immeasurably enlarged; to her life is bigger, holds more possibilities than ever were dreamed of by her grandmother, who lived contentedly within the four walls of her home — seeing and knowing very little of anything beyond. Her world has grown so, is it any wonder that she should grow more particular in choosing the man for whom she would consider that "world well lost?"

The girl of the twentieth century has become strong and self-reliant, she has learned to form her own judgments of men and things, and to form them quickly; the "clinging vine" of the eighteenth century has developed into the straight-limbed young poplar of to-day. She has lost her dependence upon men in the transition, and sometimes it almost seems as if she has lost her femininity too. And yet this is not true! That a woman can take her place on an equal footing in the world

Copyright, 1911, by M. Perry Mills.

of men, and hew out for herself a living and a position, and yet remain truly feminine to her finger tips, has been proven by some of the foremost women of our age.

JANE ADDAMS, THE FOUNDER OF HULL HOUSE

Miss Jane Addams is a splendid example of a modern American woman who has been able to take her place in the world and accomplish much public good without losing a trace of her womanliness. Nay, rather has her sex been a factor in her success.

Miss Addams was born in Cedarville, Illinois, in 1860, with Quaker blood in her veins, and brought up with Quaker ideals of womanhood, which on the whole were broader than those of most of the other sects of our forefathers. She was reared in comfortable surroundings and was well educated, having, in addition to a course in Rockford College, two years of European travel. From the first she was possessed with a huge desire to do something for humanity — something to help and uplift mankind. With this purpose she started Hull House in Chicago, a place for earnest girls to go and help the poor. In a few years, Hull House developed into an institution of four buildings, including a reading room, an art gallery and studio, a coffee house, a men's club-room, a gymnasium with shower-baths, a kindergarten, a day nursery, a music school, a boy's club-room, a club-room for working girls, and rooms for social gatherings, and all this through the strong purposeful courage and cheery persistence of a woman.

" As a result of the ceaseless but not spectacular activity of Miss Addams and other women who deserve in some cases equal credit, the Juvenile Court of Cook County — ' the world's first and most typical juvenile court,' according to Graham Taylor — was established. Laws for factory inspection, for protection of immigrants, for abolition of child labor, for the building and management of tenement houses, for better management of charitable institutions, were secured."

The administration of the city's housekeeping, especially in the ward where Hull House is situated, was improved by a woman's personal supervision. A few years ago Miss Addams was fighting earnestly to be made garbage inspector of Chicago. She secured the post, and rising at six each morning, this not very robust little lady would set out in all weathers with another " sweet girl graduate from college " as her companion to follow the garbage carts around from alley to alley and then to the city dumps in order to see that the work was properly done.

As a result of Miss Addams's campaign for cleanliness the whole community aroused itself to help in the struggle against city filth. " Every creature the settlement could muster," says Miss Forsyth in The Delineator, " did his share of the work. The children gave up marbles for paper-picking; the woman's club forgot its literary calendar and learned to sweep the street. The excitement it created, with the bonfires, the dust and laughter, stirred dirty old Chicago."

Miss Addams has gradually impressed upon America the value of her work. She was elected to the school board of Chicago, and served on it several years; she was made the president of the National Conference of Charities and Corrections, the first woman president of that body. Not only this, but Yale University, one of the most conservative of our colleges, has broken all its precedents to confer upon her the degree of Master of Arts.

And all this has been accomplished by a woman who throughout her life has retained her womanliness, and, more than that, has used her very womanliness to win the people of Chicago over to an intelligent and radical reform. " Miss Addams is a thinker and a woman of action," says an admirer, " she counsels in every emergency with definiteness and decision. She is sensitively attuned to the manners and traditions of the most privileged class, yet she meets the poorest or the coarsest without a touch of the condescension that separates people more than pride. On the whole the reach of this woman's sympathy and understanding is beyond all comparisons wider in its span —

comprehending more kinds of people — than that of any living public man."

MAUDE ADAMS

Very unlike the Chicago philanthropist, yet like her in this, that she has brought to herself success through the measure of her womanly charm, is Maude Adams, the most popular actress on our American stage.

Miss Adams's first appearance on the stage was at the age of nine months old in Salt Lake City, in a play called "The Lost Child." The business of the play required that a baby, sleeping peacefully, should be brought on the stage in a platter. The regular stage baby had an attack of stage-fright, and yelled and kicked until the stage manager was half crazy. Little Miss Maude, lying in her mother's dressing-room, placidly sucking her thumb, was suddenly seized by the frantic manager and borne on to the stage to take the place of the obstreperous infant aforesaid. For a moment, she blinked and winked in the glare of the footlights, and then she burst into a chuckling crow of delight. A thunder of applause from the audience greeted her performance. And this was Miss Adams's début.

Her father died when she was little, and Miss Adams's girlhood was spent in San Francisco, where she went to school until she was fifteen years old. Then she went on the stage, joining as a member the company her mother belonged to in San Francisco.

"I couldn't have had a better school," she has said, in speaking of her experience. "The bill was changed every week, all the standard things were played, and I had an opportunity to hear all of them, even when I did not appear. I have realised the value of this early work during all my later experience."

From these early girlhood days to the centre of the New York stage was a long journey. Maude Adams accomplished it successfully. Many people say that her success has been largely due to her woman's intuition, "yet intuition and magnetism will hardly explain Miss Adams's invariable success in the many different characters that she has interpreted. She has showed beyond shadow of doubt, that there is within her slim girlish frame the big sensitive soul of a woman and of an artist, a soul capable of understanding the great emotions and passions, and of rendering parts whose naïveté and pathos often touch us to tears."

Miss Adams has been most widely known by her impersonations of Juliet, of Rosalind and bewitching Babbie, "the Egyptian," in the "Little Minister." But perhaps, after all, the play which has won her a lasting place in the hearts of the little folks is "Peter Pan." As in this rôle Maude Adams is wholly bewitching; and has won the hearts of thousands of children in the United States. And no wonder, for as Peter Pan she is the very embodiment "of joy and innocence, of freshness of morning, and of the buoyant, creative, up-building energy of the springtime of life." In its early days there was much doubt as to how the public would take a play like Peter Pan, and astonishment, shading into regret, was expressed that Miss Adams should lend her name and talents to the presentation of so frail a part.

"But I want to play it," she said, "I want to play it because I love it."

And play it she did, — played it as "a little, joyous, woodland fellow, seeing nothing of the injustice of the world, knowing nothing of its ugliness and sin, — just a child's voice calling to the other children to come and play. And they came, — children of all ages, and all conditions, — poor, neglected children; rich, over-cultivated children; old, tired children; listened and laughed and were young. And they came, and came again until they knew the play by heart and the theatre was like a big family gathered round the nursery fire at story time. The playing of 'Peter Pan' by Maude Adams is not like an acted rôle. It is a living thought, embodied by a woman beautiful in life and thought, with the soul of an artist, and the heart of a child."

ELLA FLAGG YOUNG

Another woman we might mention in speaking of those who have succeeded in their life's work is the first woman to hold the place of superintendent of schools, Mrs. Ella Flagg Young. First a teacher, then a principal, then a trainer of teachers, she rose at last to the position of Superintendent of the Chicago public schools. "For years previous to Mrs. Young's appointment the differences over policies had so seriously divided the trustees and teachers, and had aroused so much personal antagonism that the work of the schools had suffered." Then came this clear-eyed, gentle-voiced woman to take the leadership into her hands. Quietly, without any fuss or uproar she brought order out of the chaos, and by one consent the members of the school board and the teachers alike fell into step under the leadership of a quiet, clear-brained, efficient woman.

WOMEN IN BUSINESS

And so we might go on telling of women of our generation who have stepped into the world of men and succeeded, — artists like Cecilia Beaux and Ellen Emmett and Lydia Field Emmett, who have dared to carry their own original womanly personalities into their art; or a great opera singer like Lillian Nordica, whose beauty and wonderful voice have carried before her the public of Europe and America; or a trained nurse like Clara Barton, who so efficiently organised the work of the Red Cross Society.

There are others too of whom we should speak — business organisers and financiers of great ability — for it is not in philanthropy and the arts alone that women have taken their places in the ranks of men and not suffered by comparison.

There is Mrs. Clark Fisher, the only female member of the National Association of Manufacturers, who runs one of the largest iron factories in the country. During a severe illness of her husband, Mrs. Fisher took temporary charge of the factory of which he was the head; and when her husband died in 1902, Mrs. Fisher took the entire management of the factory into her own hands. Today, she is a recognised "captain of industry," and has obtained the contract for furnishing anvils and vises for all the work on the Panama Canal.

Even more notable is the achievement of Mrs. Herrman, who conducts the industry of the H. Herrman Lumber and Furniture Companies, — firms which employ 3,000 men, pay out $2,000,000 yearly in wages and net Mrs. Herrman a profit of $1,000,000 a year.

Another woman who created a business for herself of whom we have all heard is "Mary Elizabeth," whose dainty sweets many of us have tasted. "Mary Elizabeth" began her candy making on a very small scale, producing the confections herself in her own kitchen, and establishing "Help Yourself Booths" where customers took what they wanted and put the money in a drawer. From this humble beginning, "Mary Elizabeth" has worked up until she has a large and flourishing candy trade. She does not make her own sweets now, for her hands are filled with managing the executive end of the business.

MARY BAKER GLOVER EDDY

Women have worked their way into many different fields of activity. They have become writers, surgeons, doctors, lawyers, ministers — yes — and one has become the founder of a new religion. Mrs. Mary Baker Eddy has established a new sect for us in Christian Science, a sect which has a following of over 85,000 people in the United State alone.

There is another woman in the West, young and pretty and low-voiced, who is the head of a large cattle ranch, who knows how to lasso and throw a steer with the best of the men ranchers. No one of her rough band of cowboys would use a profane word in her presence, yet so firmly does she hold the reins of authority in her slim hands that there is not one of them either who would dare to question the brisk, clear-headed commands of the young mistress of the ranch.

And so we might go on indefinitely mentioning women — hundreds of women — who have come forth to claim their right to compete with men on an equal footing — in that new comradeship which is taking the place of the old-time chivalry.

WHAT TO DO IN CASE OF FIRE

CONTINUED FROM 2974

Fire is all right in its proper place, but altogether to be dreaded where it can burn people or destroy property. So those persons who know what to do and have the presence of mind to do it are invaluable when clothes catch fire, the lamp upsets, the chimney or curtains are alight, or the house is ablaze.

Little children are sometimes burned to death because they make a plaything of fire. They like to get hold of a box of matches and make a bright light by striking them; and then pinafore and frock catch fire.

Suppose we have a little brother or sister, and one day when we are alone with him or her the clothes or hair catch fire, what ought we to do?

In the first place, we must stop the child from rushing about the room or out into the passages and open air, which he will try to do, for that would make the clothes burn all the faster; we must seize a rug, a shawl, a coat, a counterpane, a blanket, a tablecloth, a jacket, or any big piece of woollen material, and wrap it tightly round him. That will stifle the flames, and they will go out for want of air. If a rug is near, we should roll the child on the floor in it, covering our hands as much as possible, or they will be burnt too. If we cannot get a rug quickly, we should roll the child over and over on the floor. Anyhow, we must either press out or smother the flames, and if the window be open, get it shut as soon as possible.

Lamps upset sometimes, or the paper shade falls on one side and catches fire. The burning oil flares up, and there is not a moment to lose. If possible, the hands should be wrapped in a handkerchief, cloth, or leather, and we must then bravely take the lamp at arm's length and hurl it out of the window or into the grate, and sop up the oil. There is, perhaps, a tablecloth on the table where the lamp stands; the corners of it should be taken up, and the burning oil smothered with them. To pour water on the oil makes it blaze away more fiercely; but flour, sand, or earth will put out fire. It sometimes happens that the window of a bedroom is left open, and lace curtains are blown over a lighted gas-jet. In a moment the curtains are alight. Here is our best course of action now: We must first get on a chair and try to tear the burning curtains down, or, if we can do so, lift off the rods or poles. Then empty all the water at hand over them, or smother them with bed-clothes. As soon as possible we should shut the window and door to prevent a through current of air in the room. A syphon of soda-water squirted at once is a good thing to extinguish a small blaze.

Chimneys catch fire, usually because they are blocked up with soot, or the fire sets light to a beam of wood near. We must first put out the fire in the grate by pouring water or throwing flour, salt, sand, or earth over it, and then hold a board, wet blanket, tablecloth, or piece of carpet before the fireplace to keep the fumes out of the room, and to shut off a current of air from below. If the fire is very bad and likely to set the house alight, the fire-engine must be fetched, and the firemen will probably get on the roof and block the top of the chimney to keep all air out.

Now we come to talk of a very dangerous state of things—a house on fire at night when people are in bed and asleep. Sensible folk talk over this and think what they would do if it ever happened. In a high building they usually have a long coil of rope or a rope-ladder ready to fix on to the balcony, leg of a bedstead, or a large piece of furniture, so that escape is possible by the window. Failing these precautions, sheets and blankets can be knotted together into reef knots at the corners, as described on page **235**, and used as a rope to climb down, the mattress being first thrown out of the window to soften a possible fall.

Sometimes people wake in time to notice a smell of burning, and, of course, get up and find out the cause; but often the first they know of a fire at night is being choked by smoke. They wake up in alarm; but before jumping wildly out of bed and running downstairs, they should stop to think a moment and find out the place of the fire and its state. We will suppose the fire is very fierce when we open the bedroom door. If other people are in the house, we must, of course, call to them. We can do that while wrapping a blanket around us, thrusting our feet into shoes and tying a wetted towel or handkerchief around our head and mouth. Suppose the passage is full of blinding smoke. We should not try to walk upright, but creep on our hands and knees the nearest way to safety—upstairs, if the staircase is alight below us; downstairs, if it is alight above us. The air is freest from smoke close to the floor. Houses are now built so that tall ones must have a skylight, an outside staircase, or some means of exit by which we can reach the roof.

If we are in a school or a public building which catches fire, there is not only danger of being burnt, but risk of being crushed and trampled on when the crowd rushes wildly to get out through one or two doors. In schools fire-drill is usual, and the children march out, exactly as their teachers tell them to do. Everyone gets out in the shortest time possible, and there is no blocking of the passages; but when panic occurs in a hall or big public room, and people hustle and press towards the door, it is wise to look out for another way of escape, for there usually is one, a back or side door, a window to be reached by piling chairs or forms on one another.

We should then break the glass and shout. Someone outside will probably see us or hear our cries and bring a ladder. If we are in the middle of the panic-stricken crowd, we are safest if we keep our head up, our arms doubled up in front of our chests, and our elbows to our sides. That gives us the best chance to breathe and resist pressure on the ribs.

THE WIZARD'S WAND & THE MAGIC PURSE

As soon as he aspires to give a regular "show," the young wizard will feel the need of a proper "wand." The young reader may probably have imagined that the conjurer's wand was like the cap and gown of his schoolmaster, merely an item of professional costume. But in truth it is much more than this, and serves several purposes.

Though the spectator may be conscious in his own mind that it is a mere piece of wood like any other, a mystic tap with the wand, for the professed purpose of causing some magical change, goes a long way to make him believe that the change was actually produced thereby. Further, when necessary, the owner is enabled, by grasping the wand, to keep the hand partially closed, and so to conceal some small object therein. If he desires secretly to pick up or lay down any article on his table, the picking up or laying down of the wand gives him the opportunity to do so.

The young conjurer should therefore cultivate from the outset the use of the wand. A handy boy can easily make one for himself. Nicely rounded rods of hard wood, three feet long, and half an inch thick, are sold by most ironmongers for garden and other uses, at five or ten cents apiece. Procure one of these, cut from it a piece about twelve inches long, and cover this with black glazed paper. Over the last two inches of each end paste the same sort of paper, but white or cream in colour, and we shall have a wand just as good for practical purposes as if it were made of real ebony and ivory.

Having got our wand, we shall, as a general rule, come forward with it in our hand when about to begin a show. But we may now and then produce it in a more magical way. One very effective plan is to produce it from our purse, where we profess to keep it, along with our hard-earned pocket-money. Coming forward, and making a few introductory remarks, we look about us, as if seeking for something. "I am sorry, ladies and gentlemen, but I have mislaid my wand, and till I find it I cannot do anything. Ah! I remember now, I put it in my purse." And we produce it from our purse accordingly.

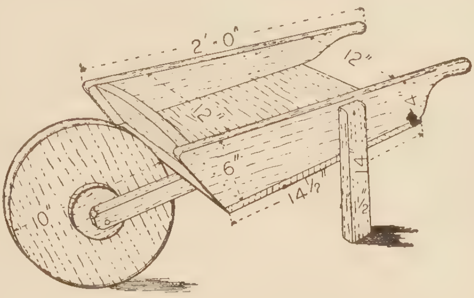
We have to admit that the last statement is not strictly true; but, however truthful we may be in private life, as a conjurer we have a sort of special licence to romance in this way; indeed, when one comes to think of it, a conjurer's whole performance is a sort of fairy tale in action. As a matter of fact, the wand is not yet in the purse, but is hidden in our left sleeve, its outer end resting against the lower joints of the bent second and third fingers. If the first and fourth fingers be left partially extended, the curvature of the other two will appear perfectly natural.

We have two purses, bag-shaped, and alike in appearance, as shown in the picture. One of these is unprepared, but the bottom seam of the other is ripped open for about an inch and a half, making a secret passage into the interior. The inner pocket remains intact, and in this we place a few coins: pennies, dimes, or quarters, according to the state of our finances. The other purse is left empty. The two are placed, one against the other, in the left trouser pocket. We must remember which we place outermost.

To work the trick, we place the left hand in the pocket, and take out the prepared purse. Transferring it to the right hand, we open it, and pour out the coins upon the table. Returning it, still open, to the left hand, and placing the fingers of the right hand inside, we get hold through the opening of the end of the wand, which we then proceed to draw out through the mouth of the purse. If we do this boldly and neatly, standing meanwhile with our left side turned towards the spectators, no one can detect that the wand comes from the sleeve. When the wand is clear we close the purse, put it back into the pocket, and remove the hand. Then, as if bethinking ourselves, we say: "I mustn't forget my money, though." So saying, we thrust our hand into the pocket again, and bringing out the *unprepared* purse, place the coins therein. We must not offer it for inspection, but if any inquisitive person asks leave to examine it, we may safely let him do so.

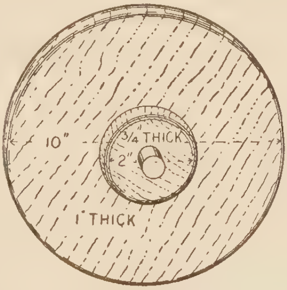
HOW TO MAKE A WHEELBARROW

THE wheelbarrow shown in picture 1 is designed to give as little trouble as possible in making. It is a toy wheelbarrow suitable for boys. The wood used in the sides, bottom, and front is three-quarters of an inch thick. The wheel, legs, and axle-bearers are one inch thick. The kind of wood used is ordinary pine. It should be planed all over, and the barrow, of course, will look better if it is painted.



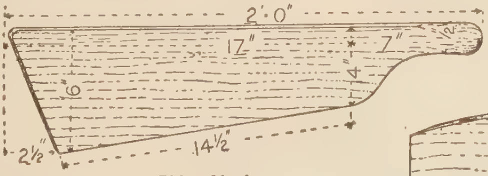
1. The wheelbarrow finished

The wheel by itself is shown in picture 2. To make it, we take a piece of wood one inch thick, and large enough to mark on it a ten-inch circle, which represents the diameter of the wheel. We mark the circle and then saw round outside the line with a bow-saw or a keyhole saw. Another way is to cut the corners off with a tenon saw and then finish to the line by paring with a chisel. In both cases a chisel should be used after the saw to cut exactly to the circle, and after the chisel a spokeshave may be used to remove chisel-marks and to round the edges slightly. A wood-turner would make the wheel for a few cents, and it would be much better made than if made with a saw and chisel. Bosses, or side pieces, about two inches in diameter by three-quarters of an inch thick, are put on each side of the wheel as shown. Their purpose is to keep the sides of the wheel from rubbing against the pieces in which the axle-ends fit. The bosses in the picture are shown of round shape, which is neatest, but they will do quite well if they are not round, but square or of any other shape. They should be nailed on exactly in the centre. The next thing is to fit an axle. This must be put into a hole bored through the wheel, and must fit rather tightly and stand out one inch at each side. A piece of quarter-inch wire, four and a half inches long, or a piece of ferrule about half an inch in diameter, will be best; but if these cannot easily be obtained, a wood axle made from three-quarter-inch or half-inch birch dowel-rod will do. The hole through the wheel should be bored half-way from one side and half-way from the other, great care being taken to start exactly in the centre. The holes will probably not meet quite in line, but this will ensure a tight fit for the axle. If the hole is bored right through from one side it is certain to come a little out of centre on the farther side, and this will cause the wheel to wobble instead of running truly with its axle.

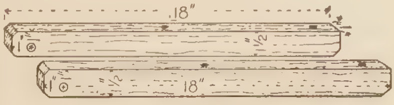


2. Wheel of barrow

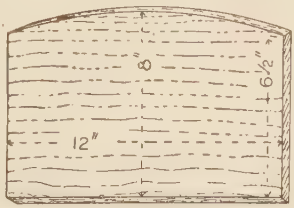
For the body of the barrow two pieces are required for the sides, as seen in picture 3. The handle part is marked to a suitable shape roughly by freehand, and worked with chisel and spokeshave. To get both sides alike one should be cut first and the other marked from it by placing them together and marking round with a pencil. The piece for the bottom is sawn fourteen and a half inches long and nailed on the under edges of the sides, as in picture 1. The piece for the front, shown in picture 5, fits between the sides, and its bottom edge is bevelled to allow it to slope. As the sides of the barrow are parallel in both directions, the ends of the front piece simply have to be made square. Its top edge will look better if it is curved as shown. The size and position of the legs is shown in picture 1. They are fourteen inches long, one and a half inches wide, and one inch thick, and have their top outside corners curved a little so as to look well. The best way to nail them is from the inside of the barrow, but one or two nails may be put through from the outside into the end grain of the bottom.



3. Side of body



4. Axle-bearers



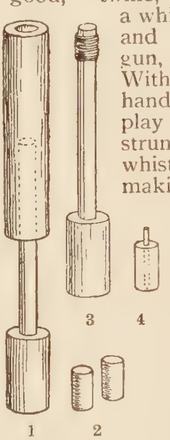
5. Front of barrow

The only thing now left to do is to make the axle-bearers, shown in picture 4, and put them on with the wheel between them. They are the same width and thickness as the legs, but are eighteen inches long. The holes for the axle are bored towards the lower edge because the wood above has to bear the weight of the barrow. The axle-ends should be an easy fit in these holes. They may be eased out and smoothed with a red-hot poker if the hole bored with the bit is too small. A little grease should be used afterwards to make the axle run easily.

The best way to attach the bearers to the bottom of the barrow will be to screw them, and it will be easier to put screws two inches long through the bearers into the bottom than through the bottom into the bearers, though the latter way would be a little stronger. Turn the barrow upside down and lay the bearers, with the wheel between them, on it. Adjust them in the middle of the barrow and parallel with its sides, so that the edge of the wheel is about half an inch clear of the front of the barrow. Screw-holes should be bored through the bearers before this is done. No holes need be bored in the bottom, or only very small ones as a guide for the screws, and they can be made while the bearers are in position during screwing. The wheelbarrow is then completed, except that it may be given two coats of paint of any particular colour or colours that may be desired.

WHAT TO MAKE FROM AN ELDER BRANCH

We all know the common elder-tree which grows by the wayside, more like a big bush than a tree. It grows very quickly, and the juicy shoots soon harden into good, tough wood. If we take one of these and examine it we shall find that the shoot, or branchlet, is really a wooden tube filled with pith, which can be easily taken out, and quite a number of interesting things can be made from the tube.



1. Popgun. 2. Corks. 3. Plunger. 4. Tube for syringe.

First of all we can make a popgun, and for this purpose we must take a straight length of thick elder wood. We can push the pith out with an iron rod, if there is one handy, or, if there is not, with a rod made from a piece of oak, ash, pine, or any tough wood. This will afterwards do for the ramrod of the gun.

We must make this rod six inches longer than the gun, and must leave a shoulder, or thick part, to prevent the rod going right through the barrel. Picture I shows how this rod, or plunger, works. With knife, glass, and glass-paper, we make the rod nicely smooth and straight, for it must move comfortably in the barrel, being neither too tight nor too loose. If it be too tight it will split the barrel, and our work will be spoilt, and if it be too loose our popgun will not work. Before pushing out the pith we must rub the rod with soap, and, if necessary, tap the end of the rod with a piece of wood. When the rod is nearly through, the pith will spring out from the other end of the barrel. Then wrap a piece of sandpaper round the ramrod, tie it on at the shoulder end, and work it through the barrel from both ends. This will clear the inside and make it smooth. Now, if we take two small corks, shaped like those in picture 2, that fit the tube tightly, soap them to make them work easily, and put them in the end of the tube, we can fire them out by pushing the ramrod down quickly.

5. Pith sailor

Next, if we tie a little worsted tightly round the end of the plunger, as shown in picture 3, and insert a tube or quill into one of the corks, as in picture 4, and fix the cork with the quill firmly into the end of the barrel, we shall have a most effective garden syringe. To make the necessary hole in the cork we burn it through with a red-hot iron skewer. It is best in this case to bind the outside of both ends of the barrel with twine, so that it may not split. To make a whistle, remove the cork with the nozzle and blow across the top hole of the gun, which we hold with the left hand. With the handle of the plunger in our right hand, we may, with practice, be able to play some simple tunes. We play the instrument in the same way that we should whistle with a key or with pan-pipes, making the scale by pushing the plunger up or pulling it down the barrel.

We can do something, too, with the pith which we took out of the tube. We first of all need a very sharp knife, and of course we must take care of our fingers. From a small piece of pith, about an inch and a half long, we cut a slice off both sides, and then sketch a design for the figure of a man upon the flat surface of the pith. Next we carefully trim away the pith with our knife until we have the shape that we want. Suppose we decide to make a little sailor boy as shown in picture 5. The cap and arms may be made of separate pieces of pith and stuck to the body. After getting the figure ready in this way, we paint the hands and face a nice pink, the jersey white, the jacket blue, the trousers white, and the boots black. The cap can be white, with a band marked "Nelson," for the name of the sailor's ship. This name we print with Indian ink or gold paint with a mapping pen. We must be sure to give the boy bright, laughing eyes, a well-shaped nose and chin, rosy cheeks and red lips. If we do all this our sailor lad will look a fine, brave fellow, quite ready for action. We make a base for the sailor to stand upon by cutting a large round leaden bullet in half with an old knife.

Of course there are all kinds of figures we can make out of the pith, soldiers, policemen, postmen, nurses, and the like, and we can also model little animals and birds, and colour these as we find them in Nature. In fact, if we are careful we shall get skilful enough to make a whole collection of quaint and dainty little articles that will be very interesting and amusing to us and to our friends.

THE NEXT THINGS TO MAKE AND DO ARE ON PAGE 3169.

These broken stone pillars are the petrified remains of a huge forest in the State of Arizona.

Copyright by Underwood & Underwood, N. Y.

FORESTS AND DESERTS

CONTINUED FROM 3008

We have learnt that the greatest forces which make the history of the earth are the deepest. Those that do most make the least noise, and it is only after long study and thought and work that we recognise them, largely because things that are nearer the surface catch our eye. In just the same way it is the mothers and the fathers, and their relations to their children, that really make the history of a nation; but politicians think that they themselves make it, and historians fall into the same mistake.

Nevertheless, there are a great many wonderful and interesting things that are always happening on the surface of the earth, and that change it quite enough to make all the difference to our lives. So now we must leave alone five-sevenths of the earth's surface, which is covered with water. We must say no more about where the water has come from and what will happen to it, though we must remember that it is not fixed for all time; and we must make a study of the two-sevenths of the earth's surface that shows above the water. We are really creatures of the land, and we depend upon other creatures of the land; and as we breathe air, and cannot live under the water, it is the land that we can study best. So we shall keep to the land, but in so doing we must remember that it is only a fraction of the earth's surface, and a shifting fraction at that. But it is, on the whole, an increasing fraction. If we examine the surface of Mars, we find that Mars, too, has had oceans, and we even find the very interesting fact that the continents of Mars were pointed to the south, as those of the earth are. But the ocean-beds of Mars are now uncovered by water. The planet has become drier.

There can be no doubt that this process, which has gone farther on Mars, is also occurring on the earth. When we study, for instance, the continent of North America, we obtain proof that, long ages ago, the area of dry land corresponding to that continent was quite small. This gradual drying up of the surface of the earth, the geologists have proved, not only as regards North America, but as regards Europe, for there was a time when only the north of Scotland and Scandinavia were above the surface of the sea. This gradual loss of water, and the appearance of dry land, occurs upon a planet, such as the earth or Mars, or upon an even smaller body, such as the moon, in two distinct ways. In the first place, water always tends to evaporate into the air, in the form of gaseous vapour, but the molecules of water, flying about in the air of a planet, are very apt to fly completely away. This entirely depends on their rate of movement, and on the size of the planet. For each planet there is a particular rate of movement among the molecules of gases in its atmosphere, which the planet is able to control.

THE EARTH IS CONSTANTLY LOSING WATER THAT FLIES OFF INTO SPACE

The bigger the planet, the greater its attractive power, and the faster the rate of movement which it can control. But when the molecules of water or any other gas exceed this rate, they are liable to escape into space, never to return. This process goes on constantly, and is one of the most important facts in the history of a world. As we know, the ocean is always being lifted into the air by evaporation under the influence of the sun. Most of what is lifted up returns as rain, but a small quantity is lost for ever. This has to be taken into account when we say that, owing to the attraction between free hydrogen and oxygen to make water, the amount of water on a planet increases. This is probably true, but the planet does not keep all that is made.

Now, there is a second way in which the surface of a world, such as our earth, or Mars, or the moon, becomes dry, and that is by loss of water into its interior. As long as a planet is molten, there are no breaks in its surface, but as it cools and shrinks, cracks and wrinkles appear upon it, and so there is the loss of water which trickles through from its surface into its interior.

If these arguments be true, we should expect to find illustrations of them in the cases of the earth, and Mars, and the moon. The smaller a world is, the sooner must it lose its seas, since it has less power of gravitation by which to hold on to the vapour in its atmosphere.

WORLDS WITHOUT WATER ARE WORLDS WITHOUT LIFE

Now, the earth is bigger than Mars, and Mars is bigger than the moon; we should expect, therefore, to find exactly what we do find. On the earth, the sea-basins are still filled with water, though the level of that water is slowly falling; on Mars, the ocean-beds are only just moist enough to nourish plant life; and on the moon, they are quite dry, and contain nothing at all. It is a very significant fact, which strongly supports these new discoveries, that the level of the inland seas of the earth is falling—for instance, the Caspian Sea, the Dead Sea, and the Great Salt Lake. Now, the level of the first two is below the level of the ocean, showing how they have been slowly emptied since they were left behind by the retreating ocean. That such is their history, we know when we see forms of life found in the ocean still present in the Caspian Sea. In the cases of both the Caspian Sea and the Great Salt Lake in Utah, we know with some degree of preciseness the rate at which they are falling.

Now, all this has a tremendous meaning, and is of supreme interest and importance to those who spend their lives in studying these matters, and who, until only a very few years ago, have not been able to understand the history of the earth between the time when it was first formed and our own. It is the wide study of the earth as a whole, especially when compared with the moon and Mars, that is teaching us these remarkable lessons. We owe them mainly to Professor Lowell, of the Lowell Observatory in Arizona.

THE DRYING UP OF THE WORLD AND WHAT IT MEANS FOR MAN

The loss of water from the surface applies not merely to the oceans, but to what we call the dry land. Now, we have already learnt that all life is lived in water, and we shall be prepared to understand that the loss of water from the earth, until at last the ocean-bed becomes dry land, must be a serious matter. After all, when the surface of the ocean falls, there is nothing to record that deeply affects life. But when water leaves the dry land, the most glorious forests, the most splendid fields of waving grass, must become deserts.

Now, it seems quite plain that the existing deserts of the earth mark the beginnings of this drying-up process, and its most serious consequences. Deserts are terrible places. Those who know them tell us that not until we know them for ourselves can we realise what the lack of water really means. One of the great desert belts of the earth includes the deserts of Central Asia, Arabia, the Sahara, and Arizona in America. Those who travel there begin to realise what water is worth for life. Now, it is a very astonishing fact that we find definite evidence of the drying up which made these deserts. In Arizona there is a mighty forest which has been all turned to stone, since it lived millions of years ago. When that forest grew there was water; there is no water there now, or almost none, and life is no longer possible, except to a small extent.

HOW LANDS THAT WERE ONCE FRUITFUL HAVE BECOME LIFELESS DESERTS

There are also records in our own half of the world, as, for instance, in North Africa and in Palestine, of the same drying-up process. It seems that in both these cases the slow making of the desert, and its creeping over what was once the habitable earth, has gone on quickly enough for even the brief period of history to record. On the south coast of the Mediterranean Sea, practically at the edge of the Sahara Desert, we find the remains of mighty aqueducts which carried water to Carthage. The size of these ruins teaches us what has happened. The streams that to-day exist in that neighbourhood could not begin to fill these aqueducts. The land is drying up, just as Palestine, which is now largely a desert, must have dried up since early Old Testament times.

If we turn to the case of our neighbour Mars, we should expect to find that the extent of the deserts there is greater, and this we do find. It is only the sea-bottoms that still hold vegetation. Five-sevenths of the surface of our earth is ocean; five-eighths of the surface of Mars is now a dry desert. The very name of Mars now has a new meaning for us. The planet was named after the god of war, and therefore of blood, because it has a red colour.

THE FORESTS THAT MAKE FOR LIFE AND THE DESERTS THAT BRING DEATH

This red colour is the colour of the desert. When the deserts of the earth are looked down upon from a mountain peak, they show just the same tint as the deserts of Mars do when looked at through our telescopes. Like our own deserts, they change scarcely at all during the seasons.

If we grasp the tremendous meaning of the difference between a desert and a forest, we shall find a new interest in geography. In other parts of this book we learn something of the work of water, and of the meaning of the green leaf. The desert is where there is no water, and therefore no green leaf, except at the little spots here and there that are called oases. We have to think of the desert as dead. The forest, on the other hand, is not only alive, but the source of more life. Its green leaves are making animal life possible, for they are providing the food which animal life requires. The trees of the forest are purifying the air, splitting up carbonic acid, and sending back pure oxygen to it. They are changing the soil and enriching it in a thousand ways, and all these ways are making for life. This is true even if we think of the remains of the trees as turning into coal, and serving the life of creatures, such as ourselves, that come into being ages afterwards.

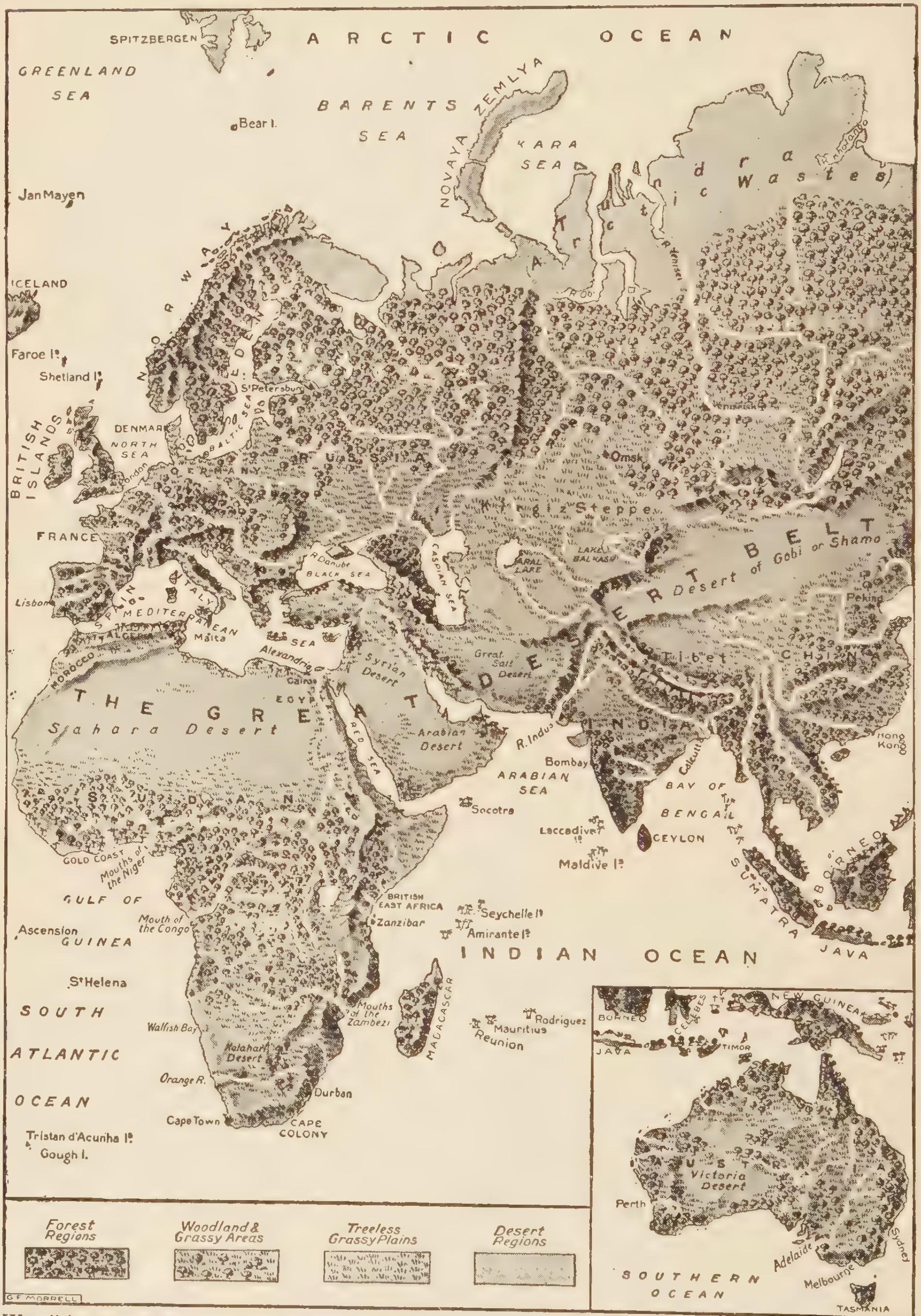
Now, the great continent of Africa, which our English cousins are so largely responsible for, and which their explorers, mainly, have discovered, supplies the world at the present day with the most tremendous instance possible of the meaning of desert and forest, and of the contrast between them. This is a point of deep importance both for the present and for the distant future.

THE GREAT DESERT AND THE GREAT FOREST OF DARKEST AFRICA

When we look at the great body of Africa, two tremendous features must strike our eye, for it furnishes us, on a gigantic scale, and in the most striking possible way, with an illustration of the two extremes that the land of our globe still furnishes. The great mass of the northern part of Africa, we know, is occupied by the desert which is called the Sahara. To the south of this, on the other hand, there is a mighty forest, which may be called the Congo forest. Right in the middle of Africa, closely corresponding to this forest, is a great river, which is called the Congo.

The basin of the Congo River corresponds to the Congo forest. The area of green extends rather farther north, and is helped by other rivers, such as the Niger, to some extent. The names of the rivers matter nothing. The point is that here is water, and here, therefore, are green leaves. It is of little consequence what colour we give to this part of Africa in our maps. A map made by someone who thought of

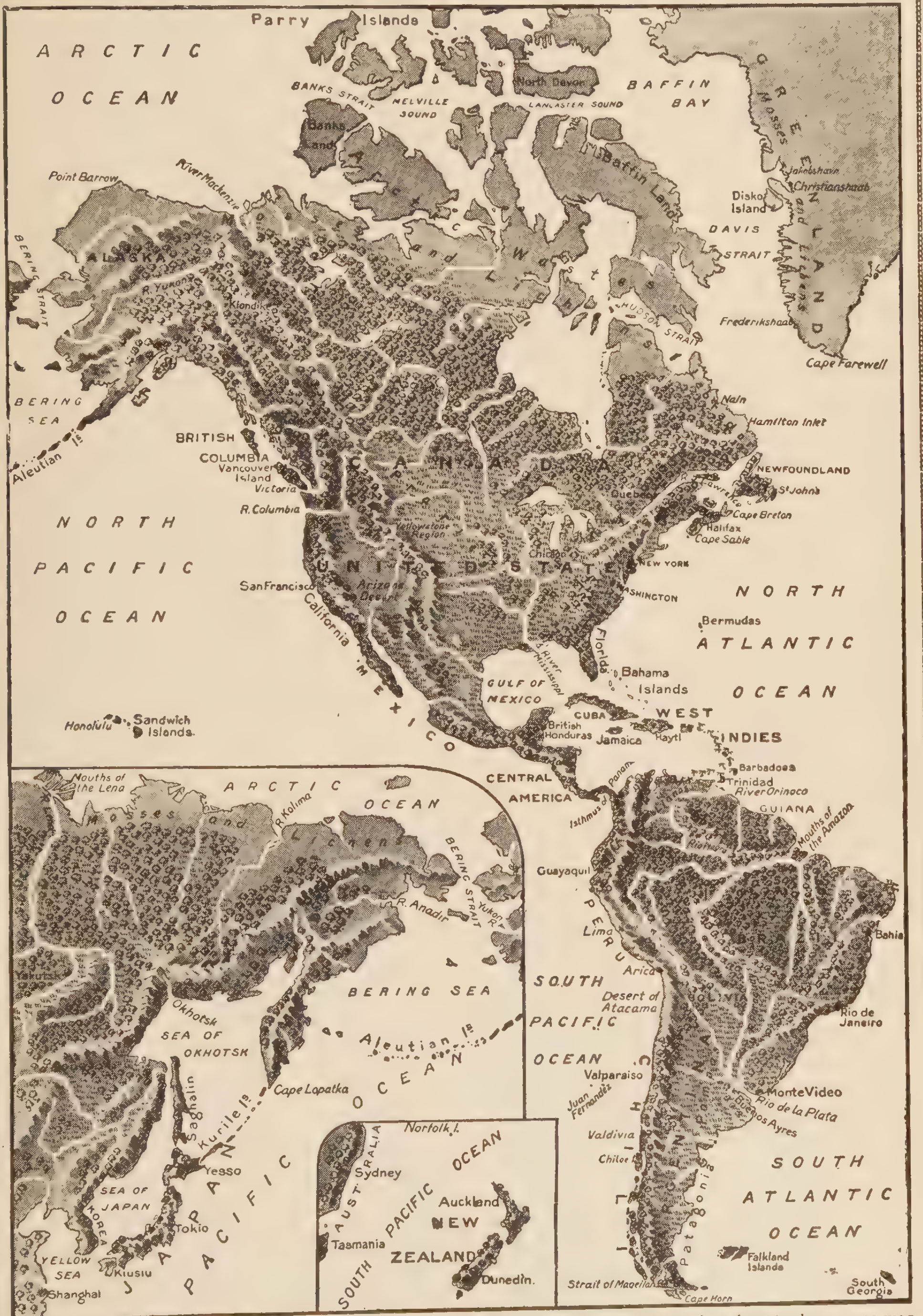
FORESTS AND DESERTS OF THE OLD WORLD



We all know that the moon has no water on its surface, in other words, that it has dried up. But not many people are aware that our own earth is also drying up, and that the deserts are spreading. In this map of the Old World we can see at a glance where the forests, the woodlands, and the grassy plains are; and we see also the great desert belt stretching right across Africa and Asia. Inland waters like the Caspian Sea are becoming shallower as the years go by, and in the desert of Gobi, in Central Asia, a great lake called Lob-nor has dried up within the last century or two. The great Swedish explorer Dr. Sven Hedin found in this desert remains of great cities and trade routes, proving that a few hundred years ago it was a flourishing, fertile country.

The photograph of the petrified forest on page 3071 is by Messrs. Underwood & Underwood, London.

FORESTS AND PRAIRIES OF THE NEW WORLD



In the New World the same process of drying up is going on, and in Arizona there is a desert where once was a flourishing forest. We can see in this map the great forests and grass plains of America, which are fast disappearing as the population increases. The wholesale removal of forests is a disastrous thing for a country. The reckless destruction of protecting pine forests in the French Alps last century, for instance, led to the steep mountain-sides being washed bare of soil, and, as a result, in thirty years the population decreased by over 25,000. The great treeless plains of North America are called prairies, meaning "meadows." In South America they are called pampas, meaning "plains," and in Europe we call them steppes, which is Russian for "heaths."

Africa as part of a living, changing world would have this great area painted *green*, and the still greater desert to the north of it would be painted *brown*.

Now we know what the brown area stands for—desert, dryness, death. We know something of what the green area stands for—moisture, life present, and life to come. Now, this particular green area is of more interest, really, than any other on the face of the earth, and that for a number of reasons, which we shall now begin to see.

THE FOREST THAT IS BEING DESTROYED FOR RUBBER THAT NO MAN CAN MAKE

It is interesting for its gigantic size and for its near neighbourhood to the other possible extreme—that great desert. It is interesting for its immense wealth of many kinds; and it is especially interesting because certain things are happening there which it is in the power of man to control.

There is a substance called rubber, which has so many valuable uses that one cannot name half of them; and there is nothing else in the world that will take its place for these purposes. It is a product of a plant; indeed, it is made by the green leaf. At present chemists are quite incapable of making rubber artificially out of the elements which compose it. It is scarcely possible to name a more valuable or useful discovery than that would be—the making of artificial rubber.

Meanwhile, rubber is demanded, and the Congo forest has to supply it, as it supplies many other things, too. This means that the people whom we call civilised men, such as ourselves, are making inroads into this forest on all sides, and this has very serious consequences. One is, that we are not taking care of the green vegetable life, which is really so priceless. Whenever we want to make a clearing, we just do so. This process is steadily going on, and more rapidly every year. We are thinking merely of the present moment, and are absolutely careless of the future and its needs.

HOW THE LOWER RACES OF MEN ARE BEING DESTROYED BY CIVILISATION

Now, there are very special reasons for bitterly regretting what is going on in the Congo forest, and however comfortably we ride on rubber tires on our motor-car, or cycle, we ought to know the price that is being paid for them. There are certain kinds of life, nourished and sustained by the leaves of this great forest, which are not to be found anywhere else in the world, and which are immensely interesting. In the first place, there are several kinds of human life which foolish and brutal men may despise, but which wise men and wise children will understand to be precious, if only because of what they teach us about mankind in general.

Unfortunately, all over the world, what is called the "advance of civilisation" is leading, as in the mighty Congo forest, to the slow but apparently quite certain destruction of all the humbler forms of human life. It is not merely in the Congo forest that this is occurring. In the case of the primitive inhabitants of Tasmania, and in other cases, the process has been finished, and these races no longer exist. As things are going at present, all over the world, it is probable that about a century will see the end of all the lower races of men.

THE STORY OF THE GORILLA WHICH MEN ONCE THOUGHT WAS A FAIRY TALE

Even if we admit that they are lower than we are—and that is true in some ways—yet they are deeply interesting, and have many lessons to teach us. Once they are actually wiped out of existence, the possibility of learning those lessons is, of course, gone for ever and ever.

Now, in the Congo forest, which we are to study specially, because it contains in itself all the lessons that we should learn, there are not only lower races of men, which are being destroyed just as the trees themselves are being destroyed, but there are also two kinds of monkeys which we do not find anywhere else, and which are more interesting than words can say. It is really only quite lately that we have known of their existence, and we still know very little about them. They are called the chimpanzee and the gorilla, and we see their pictures on page 603. It is only a few years since the death of the great traveller, Du Chaillu, who rediscovered the gorilla, and whose story of adventure nearly everyone believed to be a made-up fairy tale for many years after his return from Africa. Now, though our knowledge of these creatures is so recent, and though no limit can be placed to what they might teach us, they are rapidly disappearing. The best authority on the subject believes that the whole Congo forest cannot contain more than ten thousand gorillas, and there are none anywhere else in the world. There are probably not more than a hundred thousand chimpanzees. Now, these numbers may not sound small, but really they are very small indeed.

THE MAN-LIKE MONKEYS NOW DISAPPEARING FOR EVER FROM THE EARTH

Think of a little American country town with a population of ten thousand, and imagine that this was the whole human population of the globe; then imagine those ten thousand gorillas scattered in an immense area, which would hold the whole of England many times over, and depending for their lives upon the existence of a forest, which was daily being destroyed. That is what is happening to the gorilla, and to the chimpanzee in the Congo forest now. As things are going at present, only a generation or two will see them both extinct for ever. All this matters nothing at all to many of the people who rule the world at present. They have never seen a gorilla, and never want to, unless they can make money out of it. But, to students of Nature and of human life, it matters very greatly that these marvellous creatures should be on the point of disappearing for ever from the surface of the earth, though mankind has only just become aware of their existence.

The gorilla and the chimpanzee possess hundreds of features in their bodies which are possessed by no other creature on the face of the earth, and no other creature that ever existed, except man. There are several diseases and disorders to which we are subject which no other creatures in the world suffer from, except these two, and the two other kinds of man-like apes, the gibbon and the orang. By studying these creatures we have lately learnt some facts about human disease which are worth all the rubber in the world, all the rubber that ever was, or will be.

THE CRY FOR RUBBER WHICH DESTROYS FORESTS AND BRINGS HAVOC TO MEN

At the present moment our blind and wasteful ways are working havoc on almost every part of the earth, and nowhere more disastrously than in this mighty forest. We must have rubber for our tires, we must have it quickly and cheaply, and as long as the supply lasts for us, we do not care what happens next; we do not care that we are interfering with the future supply of rubber, that things too horrible to mention are happening to the unfortunate human beings who are the children of this forest, and that the man-like apes of marvellous kinds, to be found nowhere else on the surface of the earth, are being rapidly wiped out; and our ears will be deaf when, in some time to come, men will look back upon us and marvel that there ever could have existed human beings so selfish, so wasteful, so careless of knowledge and life.

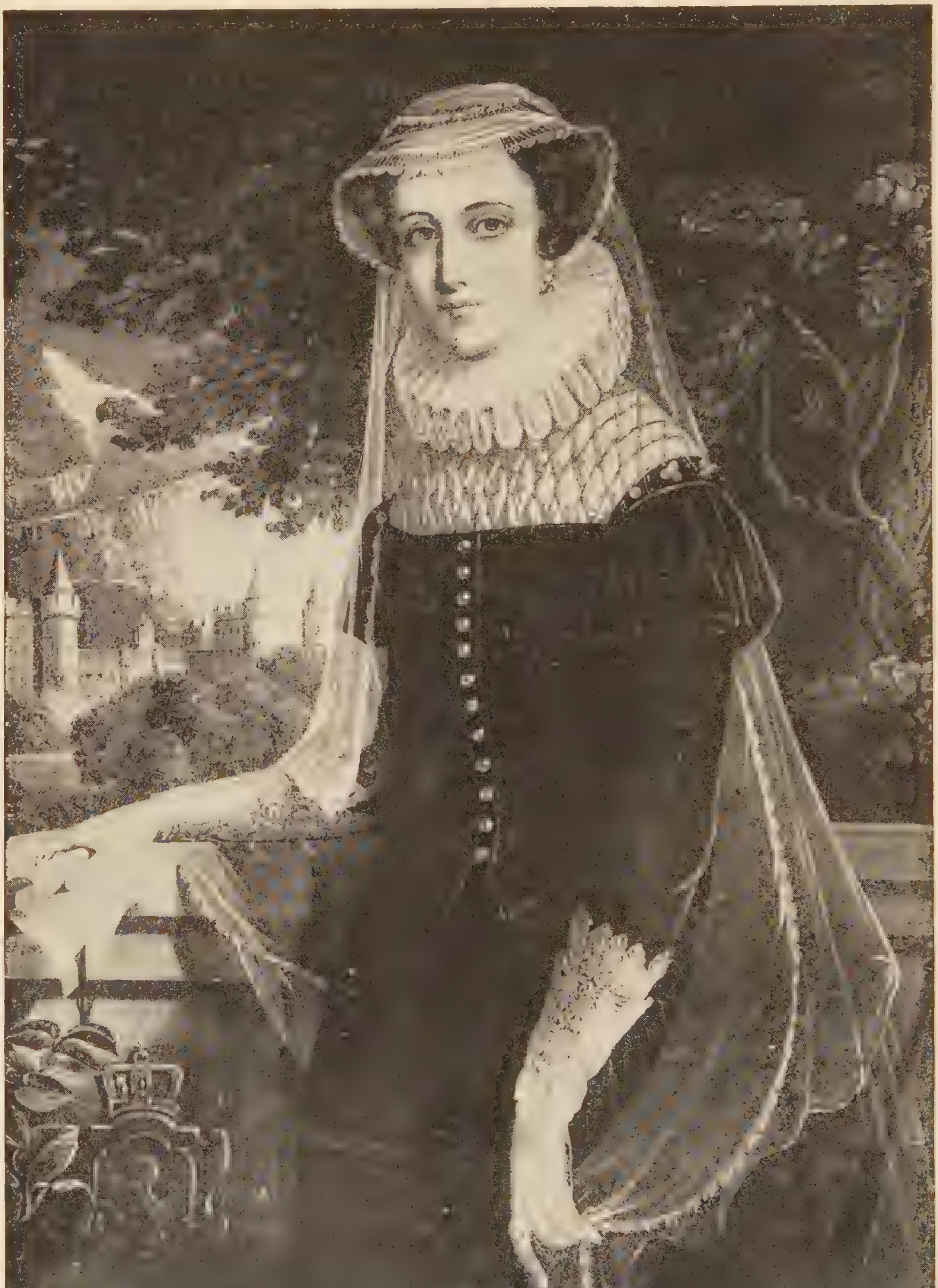
Quite lately, in our own country, the people and the politicians have begun to learn what the men of science have been saying for many years past. It is that part of our duty to the world, and especially to our children and to theirs, is to plant trees. An old rule used to be that whenever a man cut down a tree, he must, at any rate, plant a new one to make up for it. They have forgotten that good rule in England. In America we never observed it, and thousands of acres of glorious forest, hitherto untouched by any hand but Nature's, have been cut down at an alarming rate.

THE TREE THAT WILL GROW WHILE THE GROWER SLEEPS

Men do not understand that all human life depends upon the green leaf, and that to cut down trees is to hack at the rope by which we are hanging. But the time is certainly coming when we shall be wiser. Sir Walter Scott, in a famous novel, "The Heart of Midlothian," quotes the dying words of an old Highland laird, or landowner, to his son: "Jock, when ye hae naething else to do, ye may be aye sticking in a tree; it will be growing, Jock, when ye're sleeping." It is strictly true that the man who makes two blades of grass grow where one grew before is serving mankind, and so when we see the rather long word afforestation, we must remember that it means making forests, and turning waste and bare places into the homes of life of every kind. And just as it was said of some destroyers, "They made a desert and called it peace," so it shall be said of those who help Nature in her great work, "The wilderness and the solitary place shall be glad for them; and the desert shall rejoice, and blossom as the rose."

The next part of this begins on page 3227.

THE MOST FASCINATING QUEEN IN HISTORY



This is a picture of Mary Stuart, Queen of Scots, who is said to have been so beautiful and so wholly charming that no man could long resist her fascination. She was crowned when scarcely a year old and married Francis II, the young dauphin of France, when she was fifteen. Upon the death of the dauphin she became the wife of her cousin, Lord Darnley. Despite her beauty and winning ways the young queen's reign upon the throne of Scotland was full of troubles, which finally ended in her tragic death at the hands of Queen Elizabeth of England. In the background of the picture we catch a glimpse of the beautiful turrets of Holyrood Castle, where the rooms that were the apartments of Queen Mary may still be seen.

The English carrying the sacred standard at battle of Northallerton where the Scots were defeated

KINGS & QUEENS OF SCOTLAND

CONTINUED FROM 3002

THE people of what we now call the United Kingdom of Great Britain and Ireland have built up the great British Empire. But it was not so very long ago that all the "three kingdoms" of England, Scotland, and Ireland became joined together. For many centuries England and Scotland were two separate kingdoms, with separate kings. We have read about the great kings and queens who ruled over England, or over England and Scotland together; but here we read of the kings and queens who ruled in Scotland only.

In ancient days, about half of the lowlands of what we call Scotland to-day, the part that lies between the Forth and the Tweed, was a part of the kingdom of Northumbria. The rest was divided into the kingdom of the Picts and the kingdom of the Scots. Then a time came when a King of the Scots, named Kenneth M'Alpin, was chosen by the Picts for their king, too. Kenneth and his successors were still called Kings of the Scots, or of Scot-land. Afterwards a King of England granted the land between the Forth and the Tweed to a King of Scotland, and then that district also became a part of Scotland. We know very little about Scotland's kings till we come to Duncan, about the time when Canute, King of England, died. Duncan was slain by a powerful chief named Macbeth, who made himself king, and some of the stories of how he, urged on by his wife, killed Duncan and usurped the throne have been woven together into the wonderful play of "Macbeth" which Shakespeare wrote. But another story says that Macbeth had a better right to be king than Duncan, and killed him in fair fight.

However that may be, the first King of Scots of whom we know much was the son of Duncan, who won back the throne by slaying Macbeth; this was Malcolm, called Canmore, which means "Big-head," from whom all the Kings of Scotland, and of England, too, after King Stephen, were descended, because King Henry I. of England married Malcolm Canmore's daughter. Now, this Malcolm with the big head wedded Margaret, the sister of Edgar the Atheling, who was the true heir of Edward the Confessor; and that is why the blood of Alfred the Great flowed in the veins of his daughter, and of the children of Henry I., and of their descendants, right down to the present King George V.

Malcolm Big-head was a stout warrior, and he was ill-pleased that William the Norman had seized the crown of England; for he would have liked to see his own wife's brother, Edgar, on the English throne. Therefore, Malcolm fought battles against both William the Conqueror and his son William Rufus, in one of which he was slain. He was a wise and brave king, and he had great love and reverence for his learned wife Margaret, who was held to be a saint.

MARGARET ARRIVING IN SCOTLAND IN 1066

When Malcolm was dead, there were evil days, for his sons were very young, and his brothers fought each other for the throne. But after a time Malcolm's son Edgar became king, and then another son, Alexander I., and then a third, King David I.; and all these three ruled wisely. But of them David was the most famous, for he made his kingdom strong. Moreover, he was a pious man, who built many fair churches and gave much land to the Church, for which reason he was reputed to be a saint like his mother Margaret.

One of his descendants said that he had been "a sore saint for the crown," since he had made the Kings of Scotland poor that he might make the Church rich. King David was defeated in a great battle in England at a place called Northallerton, which is called the Battle of the Standard, because the English fought under a standard which was counted sacred. The battle was fought for this reason. In those days the King of England was also Duke of Normandy, and so he was both a French baron and an English king. Just in the same way the King of Scotland held earldoms in England, and was an English baron, though the kingdom of Scotland was not under the King of England. David fought as an English baron defending his liege-queen Maud against Stephen, who had usurped the throne. Although he was defeated

THE GOOD DEEDS OF KING DAVID THE FIRST

THE KING WHO SET SCOTLAND FREE

Robert the Bruce is, after Wallace, the greatest national hero of Scotland, the man who delivered his country from the English yoke. But at first the fortunes of war went against him. After being crowned at Scone, with a small coronet, because the Scottish crown had been carried off to England by Edward I., Bruce was defeated at Methven, in Perthshire, and had to flee. His wife and daughter were captured by the English, as shown here.

Bruce drove the English out of Scotland and then set himself to build up his kingdom, so that he won the name of "the good King Robert." But the hardships of early years brought on a painful disease, from which he died in 1329. His last public act was to confer a charter upon the citizens of Edinburgh, as shown in this picture.

The lower pictures on this page and on 3085, and those on pages 3080 and 3083, are reproduced, by permission, from the frescoes by William Hole, R.S.A., in the Scottish National Portrait Gallery, Edinburgh; the upper picture on page 3085 is by J. Faed, R.S.A.

and had to make peace with Stephen, he got nearly as much for Scotland as if he had won, because Stephen wanted to make sure that he would not invade England again during the civil war for the English crown.

After David, came a king who was called William the Lion, partly for his courage and partly because he bore on his shield a lion rampant—that is, a lion standing as shown on page 3079. Ever since then the lion rampant has been in the Royal Arms of Scotland; and now we see it in one quarter of the Royal Standard of the United Kingdom.

William made war on the English king, too; but one day, when there was a thick mist, he was riding with a small party of knights when he met a very much larger party, who turned out to be English. However, the Scots charged the English, but, after a hard fight, William and all his followers, except those who were killed, were taken prisoners.

HOW RICHARD LION-HEART FREED WILLIAM THE LION

Then the King of England, Henry II., would not set brave William the Lion free till he and the Scottish people had agreed that he should do homage for Scotland itself as well as for the earldoms in England. So for a time Scotland was subject to England. But fifteen years later, Richard Cœur-de-Lion put an end to the agreement, and after that, just as before, the Scots kings did not pay homage for Scotland.

For a hundred years after Richard restored the independence of Scotland, there was peace between the two countries. There is nothing more that need be told about William the Lion; and of his son Alexander II. it need only be said that he was a wise man and a strong ruler, and of such high honour that the English king, Henry III., when going to France, trusted to him to see that the northern part of England should be kept in order; but he would have been afraid a less honourable man would try to foster disorder.

After Alexander II. came Alexander III., who showed himself wise and prudent while yet a boy—for he was only seven years old when he began to reign—and he ruled for nearly forty years. And in those days Scotland prospered, and the king was greatly loved and honoured. Of the things that he did, the most famous befell while he was yet a very young man. For King Hakon of Norway claimed that he was lord both of the islands round Scotland and of some part of the mainland, and he led a great force to extend his dominion.

HOW THE THISTLE SAVED SCOTLAND AND WAS MADE THE NATIONAL EMBLEM

However, King Alexander met the Norwegian king hard by the seashore at a place called Largs, and overthrew him utterly, so that King Hakon had to give up all his claims, and thenceforth the islands owned the King of Scots for their sovereign. And the story runs that it was at this time that the Scots took the thistle with its prickly leaves for their national emblem, because the Norsemen tried to make a night attack on the Scots army, but one of them, being barefoot, trod on a thistle and cried out, whereby the Scots took the alarm and stood to their arms, and, the surprise failing, the Norsemen were driven into the sea.

Alexander III. was killed through his horse stumbling and throwing him over a precipice, and his heir was his little grandchild Margaret, the daughter of Erik, King of Norway. Now, after a time, this little girl, who was called the Maid of Norway, set sail for Scotland that she might be crowned queen; but she came no farther than the islands of Orkney in the far north, where, being very ill, she was taken ashore to die. And thereafter came trouble, for, as we read on page 748, many barons came forward to say that one or another was now the heir to the Scottish throne, and out of this turmoil King Edward I. of England made his own profit. And how he made himself master of Scotland, and how time after time the Scots rose up against the English rule, we need not go into here.

THE BRAVE KING ROBERT WHO FEARED NO MAN AND ALWAYS HELPED THE WEAK

Near the end of Edward's life, Robert Bruce claimed the Scottish crown for himself, and renewed the great fight for Scottish independence. Now, this great King Robert began with a deed which was evil enough; for, having resolved to claim the crown, he met one of the great barons, who

JAMES III. PRESENTED TO THE NOBLES

When James II was killed at the siege of Roxburgh, the Scottish nobles lost heart, but James's widow took the little king, James III., to Roxburgh, and so inspired the nobles that they pressed the English and made them surrender.

was called the Red Comyn, in a church in the town of Dumfries; and then the twain quarrelled, and Bruce slew Comyn before the altar. But from that time forth Robert showed himself always a mirror of true knighthood, for he was not only a very skilful warrior whom none could match in single combat, and a brave man who feared neither dangers nor difficulties, and a great general who could lead small forces to victory against large armies; but he was loyal and generous, tender to the weak, modest and gracious.

Many a fine tale is told of Bruce's prowess—how at one time three foemen set upon him at once, but he slew them all three; and how at another time he guarded the passage of a ford single-handed against a band of mounted men, because so long as they could only come at him one at a time he thrust them down one after the other, they not being able to cross the stream save at the one spot where he stood with his spear. As for the story of Bruce and the spider which taught him the lesson of perseverance in spite of defeat, we read that on page 2479.

THE LONG STRUGGLE FOR FREEDOM THAT ENDED IN VICTORY FOR SCOTLAND

King Robert had a hard task in setting his country free from the rule of a nation so much larger and wealthier than his own as was England, and it was well for him that for seven years King Edward II. of England was quarrelling with his barons, so that the full strength of England was never brought against Scotland. And in those years Bruce won back fortress after fortress and town after town from the hands of the English, till Stirling alone was left. Then at last King Edward marched with a mighty army to save Stirling; but King Robert met him at the field of Bannockburn, and utterly overthrew him. And after that again for many a year, while Edward and his barons went on quarrelling, King Robert sent armies into England to harry the country; till at last a treaty was made in which the English acknowledged that Scotland was an independent kingdom.

For twenty years King Robert had striven for the freedom of his country, which was won at last. But the long strife had given him no time and no chance to carry out his heart's desire of going on crusade to the Holy Land to purge his soul for that wild deed of his youth, the slaying of the Red Comyn under the roof of God's house. And now he was dying of a disease which came of the terrible hardships he had endured. Therefore, before he died, he prayed the most trusty of his knights, Lord James Douglas, to go in his place, bearing with him to the holy sepulchre in a casket the heart from his body.

HOW BRUCE'S HEART SET OUT FOR THE HOLY LAND BUT WAS BROUGHT BACK

Now, when Lord James came to Spain, on his way to the Holy Land, he found the Christians there hard pressed by the Saracens; therefore he was willing to fight on their behalf. Then in a great battle, when it seemed that the Saracens would gain the day unless they were stayed by some deed of desperate valour, Douglas drew forth the Bruce's heart, and crying, "Go thou before, as always, and Douglas follows!" he hurled the casket into the forces of Saracens, and drove his way through them till he reached it, and there was slain. But by that charge the Saracens were routed, and a knight named Sir Simon, called Lock-heart ever after, found the dead Douglas and the Bruce's heart, and bore it home, deeming that the dead Bruce had now done full service in the war against the infidels. And the heart was buried under the high altar in Melrose Abbey.

Of David II., the son of King Robert, we need not tell; and after him came his sister's son Robert, the High Steward of Scotland, who began the line of the Stewart kings, whose name began to be spelt Stuart two hundred years afterwards. After Robert II. came Robert III., who changed his name from John to Robert for better luck, because both King John of England and King John Baliol of Scotland, and also King John of France, had been so luckless.

THE KING WHO CHANGED HIS NAME FOR LUCK BUT DIED OF A BROKEN HEART

Yet he was none the better for that, since his eldest son was murdered, and his second son, James, was caught on a voyage to France and held a prisoner by King Henry IV. of England—a blow which broke poor King Robert's heart, so that he died soon after. This young prince was the first of six Kings of Scotland, each of whom

BEFORE AND AFTER FLODDEN FIELD

No more disastrous event is found in Scottish history than Flodden Field, where James IV. was defeated and slain with the flower of his army. Before the king set out, a venerable old man suddenly appeared in his presence and warned him against the war with England. But the king took no notice, and the stranger disappeared.

Flodden was a terrible battle for both sides, for even the victory of the English was nearly a defeat and their losses were very heavy. When the news of disaster reached the Scottish capital, as shown in this picture, it caused intense dismay, but the authorities calmed the people, and prepared promptly and firmly to resist invasion.

was named James. Between James V. and James VI. came the most famous of all Scottish monarchs, Mary Queen of Scots; and after Queen Elizabeth died, James VI. became James I. of England, almost two hundred years after Robert III. died. Now, of all those seven, only one, the last, reached the age of fifty. Not one was grown up on succeeding to the throne, and only one was so much as twelve years old. So we can fancy that the ruling of Scotland was no easy task, when every reign but one began with a regency. There was so much disorder that it is hardly strange to learn that of the six kings two were murdered and two killed in battle.

King James I. of Scotland was held a prisoner in England for eighteen years after he became king in name. One remarkable thing about him is that he is one of the very few kings who have been poets. James was in England about the time of the great English poet Chaucer; and, having fallen in love with a lady whom he saw through his prison window, who afterwards became his wife, he wrote a beautiful poem called the "Kinges Quhair," which means the king's book.

THE GOOD POET-KING WHO LOST HIS LIFE THROUGH DOING HIS DUTY

He was a good poet and a good king too, as he proved when he was at last set free and allowed to go back to Scotland. For there he found the country in great disorder and full of lawlessness; and, ruling with a strong hand, he protected the weak and curbed the nobles. Yet to do this he needed money, and the Scots kings were poor; so that he had to tax the people, so that there were many of them, as well as of the nobles, who were ill-content with his rule. And so it came about that Sir Robert Graham plotted against him and murdered him, as we read on page 240 in the story of the Golden Deed of Katharine Douglas, whom men called Kate Barlass.

James II., called "fiery-face," was killed by the bursting of a cannon when he was only twenty-nine. James III., even after he grew up, was but a feeble ruler, guided by base-born favourites; a lover of art and of books, but in no wise fitted to rule over a turbulent country, and over barons who would not brook being lorded over by men of no account, merely because the king chose to like them. So the barons rebelled, and routed the king's forces; and he, flying from the battle, was thrown from his horse and murdered.

THE BRAVE SCOTTISH KING WHO WA SLAIN ON FLODDEN FIELD

Then James IV. ruled, being just old enough to act without a regent. He was brave and handsome, and was very popular; also he took care of his kingdom, and in particular he tried to make Scotland powerful by sea; and the country prospered. And although he aided the pretender to the English throne, who was called Perkin Warbeck, against Henry VII., yet afterwards he married Henry's eldest daughter, Margaret.

So it came about, later on, that when Henry VIII. had no descendants left, the great-grandson of Margaret, who was the King of Scotland, became the heir of the English throne, so that the crowns of England and Scotland were united. Yet James IV. brought woe upon Scotland at the end; for when King Henry VIII. went to war with France, King James led an army into England because of an old alliance between French and Scots. And in the great battle of Flodden, James was slain himself, and with him the best of the nobles and of the soldiery. And a very famous song of lamentation for that disaster was made in Scotland, which is called "The Flowers of the Forest." Then came James V., who was an infant. And when he grew up, he, like his ancestors, had great trouble with his nobles, and also with his uncle, Henry VIII. of England, who tried hard to get him into his own power, though James would not trust him.

THE NEWS OF DEFEAT AND DISASTER THAT CAME TO A DYING KING

At last James prepared an army to make a raid into England; but it was put utterly to rout at Solway Moss. But when the news was brought to him he was very ill; and soon after, as he lay dying, there came a messenger to say that a daughter had been born to him; for he had no son. But all he said was: "It came with a lass, and it will go with a lass," meaning that the crown

"THE LOVELY, HAPLESS SCOTTISH QUEEN"

THE SCOTTISH NOBLES COMPELLING MARY QUEEN OF SCOTS TO ABDICATE THE THRONE

MARY QUEEN OF SCOTS ESCAPING FROM HER IMPRISONMENT AT LOCH LEVEN CASTLE

MARY MOUNTING THE SCAFFOLD FOR EXECUTION AFTER EIGHTEEN YEARS IN PRISON had come to the Stuarts through the daughter of Robert Bruce, and it would depart from them with his own daughter.

This daughter became very famous as Mary Queen of Scots. While she was still a tiny girl she was sent away to France, that she might be out of reach of the English; and she was brought up in the Court of France, and was wedded to the king's eldest son; so that when the king died she became Queen of France as well as of Scotland. In the meanwhile, her mother, Mary of Lorraine, ruled Scotland. But Mary was Queen of France for only one year, because her husband died, and she was a widow at the age of eighteen; and an orphan, too, for in that year her mother died also. Then the young queen resolved to return to Scotland and rule for herself.

Now, during these years there had been a great change in Scotland, for most of the people had become Protestants, and hated the Roman Catholic religion bitterly, thinking that it ought to be rooted out altogether. Moreover, this new Protestantism was very stern, and its preachers, of whom the most famous was John Knox, condemned all kinds of amusements and merry-making.

THE BEAUTIFUL YOUNG QUEEN OF SCOTS AND HER TRAGIC STORY

But Mary Queen of Scots was a very young woman, very beautiful and fascinating, and she had been brought up at the French Court, which was exceedingly gay, where she had been taught the Roman Catholic religion. So that she soon found herself giving offence to John Knox, and to all who thought with him, who would have forbidden the practice of her religion altogether. And then she was unwise enough to marry a handsome young man, her cousin, Lord Darnley, whom she very soon found to be both bad and foolish. And because she put much trust in David Rizzio, who was her secretary, Darnley had ill thoughts of her; and he, with several nobles, made a plot to slay Rizzio, and they did so, murdering him before the queen's eyes.

After that she had a great hatred for her husband; and when he, too, was murdered, a year later, and she wedded the Earl of Bothwell, whom all believed to have done the deed, everyone believed also that the murder had been done with her aid and goodwill. Then many of the nobles rose against her, and took her prisoner. They shut her up in the castle of Loch Leven, and made her give up the crown to her baby son, who became James VI. Then she escaped from Loch Leven, and her friends gathered to her; but the other party came against her, and routed her forces at Langside, near Glasgow; and she fled across the Solway into England, and called upon Queen Elizabeth to aid her.

WHY ELIZABETH WAS AFRAID OF MARY AND HAD HER BEHEADED

Now, Elizabeth was the last daughter of Henry VIII., and Queen Mary would be the heir to the English throne if she died. Besides, the Roman Catholics thought that Elizabeth herself ought not to be queen, and some of them were anxious to try to make Mary queen in her stead. Therefore, Elizabeth would not let her go free, and yet she had no right to put her to death, even if she had a share in murdering Darnley, which had not been proved; for she was not a subject of the English queen. Therefore, for eighteen years, Elizabeth kept Queen Mary a prisoner. There were many plots, in which the King of Spain had a hand, to destroy Elizabeth and set Mary on the throne; but we have no proof that Mary herself shared in them. But at last a young man named Babington made a plot, and a letter was shown which Mary was said to have written approving of the plot. Then the Queen of Scots was condemned to death for plotting treason against the Queen of England; and she was beheaded at the castle of Fotheringay, where she was held a prisoner.

THE KING OF SCOTLAND WHO BECAME KING OF ENGLAND

When Mary had been made to give up the crown, her son, who was only one year old, was proclaimed king as James VI. Regents ruled for him, but when he was just a boy he started to rule himself through favourites. But his favourites were not liked by the people, who were also angry with him because he tried to make them have bishops in their churches. When he became King of England he went to live in that country, and we read of his doings from that time in the part of this book that begins on page 1021.

The next Men and Women begin on 3243.

WHY IS MEDICINE NASTY?

CONTINUED FROM 3036

If we carefully study the laws of taste, what is liked or disliked, among the lower animals and among children, we find a general rule which should be a lesson for us all. The rule is not seen in the case of grown-up men and women, as their ideas of what is nice and what is nasty have been gradually altered by habit, and they think many things nice which no one could have persuaded them to touch when they were children.

Now, the rule we discover is that, in general, the natural, suitable, healthy foods of the creature we are studying are the things it likes. Everything else, as a rule, it finds nasty. No one would say, for instance, or at least no one who knows anything about it would say, that whiskey is a natural food for human beings, though many grown-up people take it as if it were a food, and not a medicine. But no child likes whiskey, and many medicines are not nearly so nasty as whiskey, which is really a medicine for sick people, and not a food for healthy people.

Our opinion of what is nice and what is nasty is the natural guide to what is a good food for us and what is not. It may sometimes lead us wrong to trust to this, because appetite is sometimes misleading, as sometimes it leads animals wrong; but we should be badly off without it, and it is a pity we do not use it more. A very interesting thing is that when the doctor wants to make his medicine less nasty, and as nice as possible, he adds some flavouring matter which has been got from a natural food of human beings. Fruit, such as oranges, is one of our natural foods, and the doctor uses nothing more often than tincture of orange-peel to make medicine less nasty.

WHY DO FLOWERS VARY IN COLOUR?

We do not know in any clear way what originally produces the different colours in different flowers. We cannot alter the colour of any particular flower to any great extent, even when we have the seed from the beginning, unless, indeed, we blanch it by growing it in a soil that has no iron. The colour of a particular flower is what it is through *heredity*—the general law that offspring resemble their parents.

This acts in a very remarkable way in some cases which are now being studied, especially in the colour of sweet-peas, which vary a great deal, as we all know. It may seem to us that these variations are just haphazard—white and pink and purple, and so on, occurring by chance in flowers of the same plant. But it is not so. The different colours occur in regular proportions, due to the way in which the laws of heredity work; and if we take seed from these flowers, and grow it, we find that these laws are still maintained in the colour of the flowers of the next generation. We know, too, that the single cell from which every plant starts contains tiny living parts that determine what colour of flowers it shall have, and what proportion of each kind of colour is to be in these flowers.

WHERE DOES THE FOG GO WHEN IT CLEARS UP SUDDENLY?

The answer to this question is not fully understood, but we know quite well what happens in certain cases. For instance, a wind, warm or cold, may come in and drive the fog before it, exactly as the air of a room where several people have been smoking may be cleared by making a draught. Or sometimes a fog clears suddenly because the air gets warmer, as may happen in various ways. A fog is only possible when the air is below a certain temperature, and if the sun, coming through clouds, or an inrush of warm air, raises the temperature above this point, the fog will suddenly disappear.

But electricity is also concerned in this question. We know that it is possible to disperse a fog artificially with great speed by means of electricity. This has lately been proved by an English scientist, Sir Oliver Lodge. Now, electrical changes constantly occur in the atmosphere. Indeed, we are beginning to learn that they are the principal causes of the weather; and I think it is very likely that sometimes when a fog suddenly disappears, as if by magic, it is because of some electrical change in the air, of the same kind as that produced by Sir Oliver Lodge's machine for dispersing fogs.

WHY ARE OUR VEINS BLUE WHEN OUR BLOOD IS RED?

The blood in the veins is certainly not blue, and there is no such thing as "blue blood"; but it is quite different from the bright red of the fresh blood that has come from the lungs and travels to the body through the arteries. We see the light reflected back to our eyes from this dark red blood through the walls of the vein, and it is these walls that give it its bluish tinge. If we have seen the dark, dull colour of the blood as it runs in the veins, we shall easily understand that it needs only a little change of its colour to make it a dull blue.

WHAT HAPPENS TO THE CARBONIC ACID GAS THAT WE BREATHE OUT?

There is always a certain proportion of carbonic acid gas in the air, even in the open air. The carbonic acid gas we breathe out is added to this, which is indeed the product of the past breathing of countless millions of animals and of the burning of carbon in countless fires. The air, rich in carbonic acid, that we breathe out does not stay by itself, so to say, but the various things composing it, including the carbonic acid, gradually spread themselves out into and mix with the air around them.

This very important law is true of all mixtures of gases. Whenever different gases are put together, the molecules of the one gradually pass among the molecules of the other. This is called the diffusion, of gases. So by means of diffusion the carbonic acid gas that we breathe out is, before long, quite equally mixed with the rest of the air. As we know, it does not remain for ever in the air unchanged, for, wherever there is green vegetable life, some of the carbonic acid of the air is decomposed, the carbon being taken into the plant and the oxygen left in the air to add itself to the free oxygen which is always present in the air.

So the carbonic acid goes on a ceaseless round or cycle, in which animal and plant share and help one another.

WHAT IS A MIRAGE?

A mirage is an appearance, low down in the sky near the horizon, of something that is not there. It occurs especially in certain conditions of the air when it is very hot, and most of us have heard how it deceives travellers in the deserts of hot countries. Sometimes in deserts there are spots called oases, where there is water, and, since there is water, there are also green trees and shade. And we are told that sometimes travellers think they are coming to an oasis only a few miles away, where they can get water and shade; and then, as they travel on, it disappears. A great explorer once "discovered" and named a mountain which did not exist, but which he had seen as a vision, or mirage. So we apply the word mirage sometimes to a thing that looks real and pleasant from a distance, but which, as we get nearer to it, vanishes altogether. I am afraid we all see mirages of this kind at some time in our lives.

WHAT CAUSES THE MIRAGE?

The true mirage is not an appearance in the sky due to nothing at all, and it is not purely imagination on the part of those who see it. When the traveller sees an oasis in the desert, and it fades and deceives him, what he has seen is the image of a real oasis, much farther on, below the horizon. The light from the real oasis has been somehow reflected from a layer of air, and so the traveller sees it—as if there were a huge mirror in the sky placed at such an angle that it threw a view of the oasis to the traveller's eyes.

It must be that there are layers of air of very different temperatures, and therefore of very different density, and whenever light passes from one thing into another of different density, part of it does not go on, but is reflected. Appearances due to a similar cause are often seen at sea. A ship near the horizon may seem to have another ship, exactly like itself, perched upside down upon it, the masts of the one beginning where those of the other stop.

HOW DOES THE VOICE GET INTO THE GRAMOPHONE?

A gramophone is a special kind of phonograph, and the phonograph was invented by Edison. The two words are really the same, only the two parts of them are turned the other way. *Gram* or *graph* means "write," and *phone* means "sound." The voice, or whatever the sound is that the phonograph records, writes itself on a plate or a cylinder. What happens is that a small needle is shaken and made to write by the sound, being connected with a drum against which the sound-waves strike. When the instrument is played, the marks on the record are followed by a needle, much the same as that which made them, and the needle, being shaken as it follows the tracing, shakes another drum, and that shakes the air—or produces sound-waves—in exactly the same way as when the record was made.

If we look closely at one of these marvellous machines when it is being played, we can then see for ourselves the faint, irregular line on the record, the needle following it, and the drum to which the needle is fixed, and we shall hear the sound-waves made by the drum as the needle shakes it. People who study sound, especially the sound-waves of the various letters we use, photograph these records and enlarge the photographs, and so can study exactly the shape of the sound-waves that make a and e and the other vowels.

WHY DOES NOT THE MOON MAKE WAVES ON RIVERS AS WELL AS ON SEAS?

The moon does not exactly make the waves of the sea, but it draws the sea after it as the earth spins, and as the sea usually moves in waves, due to the wind, so the tides rise and fall in waves. This is a wise question, for we might think that the water of a river ought to behave as the water of the sea does, and there is no doubt that water everywhere, and every liquid surface, and even the solid crust of the earth, are affected by the moon.

But the sea is deep, and so there is enough water to be heaped up under the pull of the moon, and to make visible tides. The water of a river is very shallow in comparison with the sea, but near the mouth of most rivers, where they communicate freely with the sea, the great tidal stream of water flows up and down the river as the tide flows and ebbs; and so the influence of the tides can be seen in these tidal rivers, perhaps many miles up from the sea. Thus, the tides can be noticed in the Hudson in New York, and in such cases the moon does "make waves," or, rather, an inflow and outflow of water, in rivers.

WHY DO TELEGRAPH WIRES SEEM TO GO UP & DOWN WHEN WE ARE IN A TRAIN?

They seem to go up and down because they do go up and down! That is to say, the telegraph wires "hang," and are not straight like a piece of wood. We see this well from a train because it carries the eye along very quickly at the same level, so that even though the curve of the wires is not great, we can notice it. The earth is pulling on the wires, as it pulls on all matter everywhere. This is another way of saying that they have weight, and this makes them sag, or drop a little, between the telegraph posts. Metal wires are, of course, quite heavy, and they "give" under their own weight. But if you have flown a kite to any height, you must have noticed the same thing even with a light material like rope or string. When the kite flies high, the string does not rise in a straight line from your hand to the kite, but curves in the air—always downwards under the influence of the earth's pull—or, as we say, by its own weight.

WHAT IS PAIN, AND WHY DOES IT HURT?

Not the wisest man can answer this question, but we know some things about it. We know that certain nerves run to the skin, and that when they are excited the result is pain—just as when the eye nerve is excited the result is sight. We know that when these nerves are damaged and cannot work, the skin cannot feel pain. Also, we know that when any other nerves are excited too intensely the result is painful. Loud music may be very pleasant, but there is a point beyond which it quite suddenly becomes painful. Similarly, a bright light may be beautiful and pleasant, but beyond a certain point it suddenly becomes painful.

No one, however, has any idea what happens in the nerve or in the nerve-cells when this change comes, though it has lately been thought that when a nerve is very highly excited it changes in shape. This, however, does not tell us in the least why pain should go with it. No one could explain what pain was to a person who had never felt it, except by causing him pain. Similarly, you cannot describe sight to a person born blind. Words cannot describe these things, except to people who know them by experience already.

WHY IS OUR SHADOW BIGGER THAN OURSELVES?

Our shadow is not always bigger than ourselves. It depends entirely on the height of the sun above the horizon. When the sun is high, our shadow is much shorter than we are; if the sun were right above us, in the part of the sky which is called the zenith, or highest point, then our shadow would be just a tiny mark round our feet. But the lower the sun falls, the more do its rays slant as they approach the ground, and so our bodies may throw shadows many feet in length. If we always think of light-rays as travelling *outwards* in straight lines in all directions—as you will easily understand if you consider a candle or a gas-jet—we shall see that the shadow of a thing will be bigger the farther away it is thrown. Sometimes we can notice this in the case of our own bodies. When the sun is low among the mountains, we may be standing on one peak or ridge and throw a shadow which does not strike the ground at our feet, but crosses a valley and strikes the side of another mountain, such as we see in the picture on page 1724 Such shadows may be enormous, and even terrifying. When the earth gets between the moon and the sun, it throws a shadow which we call an eclipse of the moon. This shadow falls upon the moon and darkens it to our view. You can test the rule about the size of shadows at any time with a pencil and a candle, or with your hand near the ground on a tablecloth in sunshine.

CAN WE SEE LIGHT AND DARKNESS ANYWHERE AT THE SAME TIME?

If we could stand on the moon, we should perhaps be able to do this, for the moon has nothing to scatter the sun's light, and so the shadow of night would have quite a sharp edge. But the earth has the atmosphere, which is always scattering and reflecting the light that passes through it, so that the advancing shadow never has a sharp edge. This is why we have twilight. The sun has set, it is below the horizon, and if there were no atmosphere we should be in total darkness the moment the sun set; but the air reflects the light from above down upon us for a time.

Of course, the higher part of the air can see round the corner of the earth, so to speak. The sun's rays still fall upon it, though we are cut off from them; and it turns them to us so long as it gets any. Gradually, as the sun sinks lower, its rays strike higher and higher in the air above us, until at last they fail altogether, and twilight has passed into night. In some parts of the world, owing to the state of the air, the air reflects much less light downwards, and in those places we say that night falls very suddenly. But nowhere can we see the advancing shadow of night. How impressive it would be if we could!

WHY IS ICE SLIPPERY?

We say that a thing is slippery when its resistance to motion along its surface is very slight. This resistance, or friction, is a thing we rather dislike—especially in machinery; but we should find things very inconvenient without it. Walking and running would be utterly impossible without friction, and even standing still would require the most perfect balancing. When we walk on ice, we get as much friction as possible from our boots. If we tried to walk on boots soled with ice, or covered with an even layer of oil, we could not walk at all, for there would be practically no friction to keep our feet where we planted them. The absence of friction in the case of ice depends upon its beautifully even, crystalline structure.

The molecules of water are held together very smoothly and evenly, and this is especially so if the ice formed when there were no currents in the water and no wind, so that its surface was very smooth when it became frozen. Various substances, like oil and wax and varnish, will give an extremely smooth surface even to things like wood, and so render them almost free from friction. When we skate, we use a metal surface as smooth as possible, both on the flat and on its two edges, and though there is no small amount of friction when the blade cuts a line in the ice, yet it is not enough to prevent us from sliding on the skate-edge for many yards at a time.

WHEN A LEAF IS PLUCKED FROM A TREE, DOES IT HURT THE TREE?

The word *hurt* may mean *injure*, or it may mean *pain*. The plucking of a leaf does not pain the tree, because a tree cannot feel anything that we should call pain. But when a living green leaf is plucked from a tree, the living cells where the break is made must feel something, only it is a very faint feeling; and, of course, we must not think that it is in the least like pain, or that it is possible to be cruel to a tree, as one might be cruel to a cat. When a dead leaf falls from a tree, the tree cannot feel anything, for a layer of something like cork has been formed at the base of the leaf, and so the leaf is really no longer part of the living tree.

If *hurt* means injure or harm, that is really another question. The leaf exists for the life of the tree; it serves to feed the tree; it breathes for the tree, and helps to remove from it the water which the roots have sucked up. Of course, a tree has many leaves, and so to pluck one cannot hurt the tree much; but if we were to strip all the leaves off a tree in the spring, we should soon find that that harmed the tree. But when the wind blows the leaves off a tree in autumn, the tree is not harmed, for it has already taken what it wants out of the leaves, and has no use for leaves until the next year.

WHY DOES NOT THE SUN DRAW UP THE SALT FROM THE SEA?

The different elements and compounds differ naturally and permanently from each other in the extent to which they are *volatile*, or fly-able. Some, such as the gaseous elements, and a liquid element like bromine, or a solid one like iodine, are very volatile; so are many compounds, such as water. They readily give themselves off as gases to the air if the conditions are at all favourable. But many other elements and compounds can only be volatilised, as we say, with extreme difficulty. Carbon, for instance, is one of the least volatile of all substances, yet under the tremendous heat of the electric arc-lamp, or in the hot stars, carbon can be made volatile.

The salts of the sea are among the least volatile of compounds. If heat enough were applied to make them volatile, they would probably decompose, or be broken up into their elements, first. So the sun can evaporate, or *make into vapour*, only those things, such as water, which turn readily into vapour. It cannot bring nearly enough heat to bear on the salt of the sea for this purpose; and if it did, as we have said, the salt would probably break up rather than evaporate as salt, and would give off its elements as gases.

WHAT IS A THUNDERBOLT?

We know that lightning often strikes houses and trees, and even people. With lightning goes thunder, and long ago it was supposed that something, a "bolt," was actually thrown from the sky during a thunderstorm, and struck such things as trees. The thing that men thought was thrown was called a "thunderbolt." In those days people thought that God threw thunderbolts and so destroyed those with whom He was angry. The Romans, too, taught that the thunderbolt was the bolt of Jove, or Jupiter, who was their chief god. But we know now that there is simply no such thing as a thunderbolt, and the damage that it was supposed to do, is really due to the passage of an electric current from the air to the earth, which damages anything it passes through.

WHY DOES THE SUN MAKE THE WET SANDS STEAM AT THE SEASIDE?

I am sure, said the Wise Man, that the boy or girl who asked this question could answer it. I think so, partly because it is an easy question, but specially because anyone who carefully observes or notices things should be able in time to explain them. It is the very first thing in the study of the world, or of anything, to observe the facts carefully. Many people do not notice at all a thing like this, or, if they do, they forget about it. They cannot learn much until they learn to notice. The answer to this question is, that, when the sun comes out, it raises the temperature of the air so that it is able to hold more water in it, and it also raises the temperature of the sands and the cliffs and the water lying on them, so that the water passes into the air in the form of steam. This passage of water from air to earth, and back again, is always going on, but we seldom see it in this plain way.

WHY DOES IT RAIN SO MUCH IN SCOTLAND?

This is another of those very difficult questions about the weather which no one can fully answer yet. One of the great causes of rain is the existence of much water for the sun to draw up, and so any island is far more rainy than the interior of a continent, such as the Sahara Desert. That applies to the whole of the British Isles. But the rain that falls in the islands is principally brought from the greatest expanse of water near them, which is the Atlantic Ocean. So it is chiefly the "warm, wet western wind" that brings the rain. It deposits the rain most where it is most cooled, and as Scotland is farther north than England, it is colder; and so its climate condenses more rain than the climate of England does.

Scotland also has a very broken west coast, so that the water of the sea comes far up into the land, as in the case of the Clyde, round which there is more rain than anywhere else in Scotland or in England. The west coast of Ireland is very rainy, too, and I think that poor Ireland catches part of the rain which would otherwise fall on England. Scotland, again, is very hilly and mountainous, and we know that air is cooled in rising over hills, and so deposits much of its moisture as rain. Of course, the east coast of Scotland—for instance, such a county as Berwickshire, which is also rather flat—is far drier than the west, for when the west wind reaches it, it has already spent most of its moisture farther west. These are some reasons why Scotland is more rainy than England, but there may be more.

WHY DOES A PIN GET HOT IF RUBBED AGAINST A STONE?

All rubbing, or friction, produces heat. If you had a really delicate thermometer, you could easily prove that paper and india-rubber and the air around them all get hotter when you rub out something you have written. The motion that starts the rubbing is changed into the special kind of invisible motion called heat. In the case of a pin rubbed against a stone, we notice the heat-effect of friction particularly well. This is, first, because the pin has a narrow edge and a sharp point, which is very much stopped by the uneven surface of the stone; and, second, because the pin is made of metal, and all metals are very good conductors of heat. So the heat runs up the pin very easily and quickly, just as it runs up a poker held in the fire, and that is why we feel it so distinctly.

WHY DOES NOT SNOW FREEZE UP FLOWERS?

Sometimes snow does freeze up flowers, but only when the earth itself has become very cold, so that the soil-water has been frozen. Even then, plants do not always die, by any means. Sometimes they seem merely to stop living, as it were, for a little, and then start again. But plants and flowers are protected against cold, if they are accustomed to live in cold places, by the fact that they produce heat within themselves.

We think, perhaps, that only warm-blooded creatures like ourselves produce heat, that a frog does not, and still less a plant. But every living thing breathes, all breathing is burning, and all burning produces heat. Therefore, every living thing produces heat, and plants are no exception. In quite a number of cases now, men have succeeded in measuring the heat produced by plants, and they have shown that many plants always maintain themselves at a temperature hotter than that of the air around them. Plants vary widely in their power of resisting cold. The vine will not stand the cold in which an Alpine plant thrives; but where plants do resist cold, it is because of their power to produce heat, and probably also a power of keeping water liquid inside their living cells, though it would freeze at the same temperature outside.

WHY WILL INDIA-RUBBER RUB OUT PENCIL AND A CERTAIN SORT RUB OUT INK?

When india-rubber rubs out pencil-marks on paper, or "ink-eraser" rubs out ink-marks on paper, or pumice-stone rubs out ink-stains on our skin, what happens is really the same in every case. It is the rubbing, or the friction, that actually rubs away the outer layers of the paper or the skin, and so removes anything that they may contain. Soft india-rubber rubs away only the surface-layer of paper, but that is enough for pencil-marks, which only deposit a thin layer of carbon on the surface of the paper. A harder rubber—or a knife-edge, which acts in exactly the same way—will rub off a thicker layer of paper, and so will remove ink-marks, which penetrate much more deeply into paper, being made by a liquid. Pumice-stone is hardest of all, and when we rub our fingers with it, it removes ink-stains, which are deeply absorbed by our outer skin, as india-rubber could never do.

WHY DOES NOT THE EARTH GET IN THE WAY OF OTHER WORLDS?

The earth is kept in its course by the sun's attraction, we know, and so are the other planets. As none of them can leave their own path, they do not get in each other's way. But if any other body came flying into the solar system, it and the earth or one of the other planets *would* get in each other's way. This does sometimes actually happen. Comets, which are in a sense separate worlds, though, of course, very small ones, sometimes fly into the solar system, attracted by the sun, and are carried out of their course by one or other of the planets.

Jupiter is the giant planet, and is farther away from the sun than the earth, so it is usually Jupiter and a comet that get in each other's way. Jupiter may have caught several comets in this fashion, or, if it has not actually caught them, it has altered their path, as your path is altered when someone gets in your way. It is very likely that the moon of Jupiter which was last discovered, and perhaps some of the others, were caught in this way. They were probably little independent worlds, until they ventured too near the giant planet, and were caught by him, and compelled to circle round him as all his moons now do. It is just possible that our moon was caught in this manner, because it got in the earth's way; but it is much more likely that the moon was once part of the earth.

WHY DOES WATER CRACKLE WHEN A RED-HOT POKER IS PUT IN IT?

The crackling noise is due to the bursting of little bubbles of something. A bubble is a closed envelope of fluid containing a gas of some kind. Usually this gas is rather compressed, and as it expands it stretches and makes thin the liquid envelope until it bursts. Then the gas escapes and expands very suddenly, and makes a little explosion, starting the waves in the air which we hear and call sound. It only remains, then, to find out what makes the bubbles in the water. A cold poker will not make them.

Therefore, it is not the iron of the poker, nor the shape of the poker, that makes them, but its heat. With everything else but its heat, the poker will not make bubbles. It is not difficult to see how the heat does this. It rapidly turns the water near it into gas, and this gaseous water, and also the air dissolved in the water, form bubbles of hot, compressed gas surrounded by an envelope of liquid water. These are quickly made and quickly broken, and in breaking they make the crackling noise that we hear.

WHAT MAKES THE NOISE WHEN A BAG BURSTS?

The noise of a bursting bag is due to the same cause as the crackling of a bubble or any other kind of explosion. A bag is really a kind of bubble, only the envelope containing the gas is not made of liquid, but of paper. Also, the gas is not under pressure, for it is not hot, and does not tend to expand and make the bag-bubble burst. So we apply the pressure from without, which comes to the same thing, by striking the bag between our hands, and so it bursts as a bubble bursts, and with the same result—the starting of the air-wave that we call sound. It is a noise, and not a musical note, because the air escapes irregularly, "anyhow," from the bag, and so starts an irregular air-wave, and not a regular wave consisting of even vibrations at a fixed rate. If it were such a wave, we should hear a musical note. The air escapes from the bag of bagpipes, and makes a more or less musical note because, as it passes out, it strikes something which vibrates regularly and so throws the air into regular waves.

WHAT MAKES THE SOUND IN THE ORGAN?

When the organist puts his finger on a key, he allows air to enter the pipe of the organ that corresponds to the key he touches. The air is thrown into vibration in the pipe, and this spreads in all directions through the air and makes the sound we hear. It is really a vibrating column of air that produces the sound, while in the piano, or the violin, it is a vibrating string.

So the organ is really a huge wind instrument, as the others are stringed instruments. The rate at which the column of air vibrates decides the note we hear, and depends on the length of the column, which, of course, depends on the length of the pipe. Thus, a pipe 32 feet long will hold a column of air that vibrates just half as fast as the column in a pipe 16 feet long, and the note of the longer pipe will be exactly an octave below the other. It would not do if there were nothing but a plain pipe, because, of course, the air would simply rush through it with a hiss. At one end of the pipe there must be something to throw it into vibration, a "tongue," which may be made of various materials and shapes according to the particular *quality* of the note we want. But the *pitch* of the note is decided by the length of the pipe.

WHY SHOULD ANYTHING LIGHTER THAN WATER FLOAT?

It is a law of Nature that lighter things pass above heavier things—just as the dregs of a liquid fall to the bottom, being the heaviest part of it, and the scum rises to the top, being the lightest part of it. We may make a kind of explanation of this by saying that the attraction of the earth is greater for the heavier thing, and so it passes nearer to the earth; while the attraction of the earth is less for the lighter thing, which accordingly does not get so near to the earth. The law is the same for all liquids and for all gases. A lighter gas floats on a heavier gas, and a lighter liquid on a heavier liquid. Also we find that when anything floats in water, the weight of the volume of water which it pushes out of its place is equal to the weight of the floating thing. This is the most important law of floating. If the mass of water displaced by a thing is lighter than that thing, then it must sink; and if a thing floats, the amount of it under the water is such as to displace a quantity of water equal in weight to the whole thing.

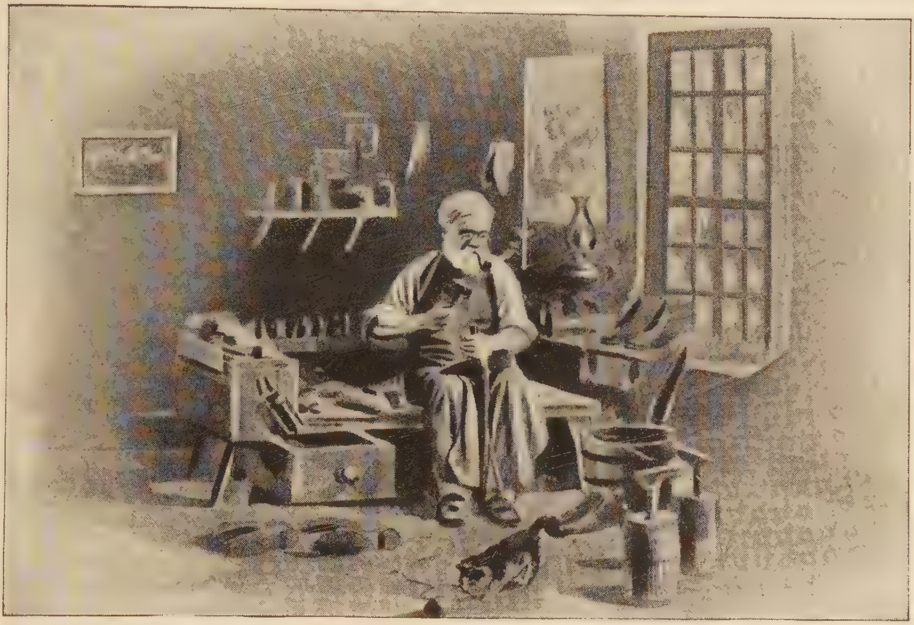
WHAT DOES "EUREKA" MEAN?

This famous word means "I have found it," and the story goes that it was used by one of the greatest men of antiquity, Archimedes, who discovered the law named in the last question. The king's crown had been in the hands of the goldsmith, who was suspected of having replaced some of the gold by some other metal; and Archimedes was set the task of finding whether this was so. He did it by putting the crown into his bath, and noticing how much the water rose; and he is said to have run out into the streets shouting "Eureka! Eureka!" And now, when we have found out something we have been searching for, we sometimes repeat his famous exclamation.

WHY DOES THE OUTSIDE OF A CUP CONTAINING ICE CREAM GET WET?

When we put ice cream in a cup, the cup becomes very cold. The air around it becomes cold, too. The reason is that the heat in the cup and in the air are pouring into the ice cream, and what they lose it gains. Now, the air has in it a good deal of water-gas, or water-vapour; but when it is cooled this water-vapour cannot remain as vapour, but turns into liquid water, which gathers on the outside of the cup. The wet on the cup is therefore dew, and it forms on the cup just as dew would form on the cup if, without any ice cream in it, you simply put it in the garden in the evening. The amount of water that air can hold gets less the cooler the air is, and so, whenever air is cooled, some of the water in it will be deposited upon the surface which is cooling the air. The heat of the air round the cup passes into the ice cream, and that, of course, is what melts it.

The next Questions are on page 3233.



THE STORY IN A PAIR OF SHOES

If you look at your shoe, you will notice three parts, the upper, sole and heel. We may think the story these parts have to tell is very simple and brief, but when we learn that they pass through one hundred and sixty different machines and two hundred and nine different pairs of hands, we begin to realize that the making of a pair of shoes is not such a simple matter as it seems. Let us see how it is done.

All the different kinds of shoes worn at the present time have interesting stories of their own. The "peg" shoe could tell how it gets its name from small wooden pins or pegs, which are driven through the soles and uppers to hold them together. The "standard screw" shoe, which is very strong and heavy, might relate how its sole is attached to the upper by a threaded brass wire, which is screwed in. The "McKay sewed shoe" might tell how it took its name from Gordon McKay, through whose influence the McKay Sewing Machine was perfected. The "turn" shoe, which is very light, could tell a longer story, for, though it is now worn by only a few people, it was invented centuries ago. But more important than any of these is the Goodyear Welt shoe, which is worn by a great many people and is now considered the best machine-made foot-wear.

THE UPPER, SOLES, HEELS AND LAST

When an order is received at the factory, a very careful description is made of the shoe ordered, telling its size and style and the quality of the material to be used. Similar descriptions, or specifications, of each part are sent to the foreman who has charge of the making of that part. From careful measurements of these parts, the patterns of the soles and parts of the uppers and linings are cut out, and the lasts are also made. The last, which is made of wood, is exactly the size and shape of the foot for which the shoe is made. Usually many shoes are made from the same pattern and on the one last.

Copyright, 1915, by M. Perry Mills.

The parts of the upper are cut out of leather which is tough but soft and pliable. The machine which does this work cuts more quickly and accurately than any human hand. The edges of these parts are "skived" or thinned down to a beveled edge, then given a coating of cement, and afterwards folded on a machine, which turns back the edge and pounds it down flat, so that it presents a smooth and finished appearance. The perforations are then cut along the edge of the toe-cap. On one of the top linings is stamped the order number and size of the shoe. Then the parts of the upper are sewed together, and the lining is put in. A machine rapidly puts in the eyelets, placing them on both sides at once, directly opposite each other. This finishes the upper.

The outsole, or outer sole, is cut from sole-leather, which is thicker and stronger than that used for the upper. It is then passed to a heavy rolling machine, where it is subjected to tons of pressure between heavy rolls. This pressure, which takes the place of the hammering which the old-time shoemaker gave his leather, brings the fibres more closely together, greatly increasing the wearing qualities. The outsole is then passed through a machine, which reduces it to a more uniform thickness.

The insole, which is made of much lighter leather, is prepared in a similar manner, and is also reduced to a uniform thickness. A machine cuts a slit which extends half an inch into the edge of the insole, separating the edge into two parts. One of the edges is called the lip. The same machine cuts a small channel or groove along the surface inside the lip. The lip is now turned up by another machine, so that it stands at right angles to the insole. To this lip the welt and upper are sewed later on, and the groove made by the channeling machine inside the lip then serves as a guide for the operator of the sewing machine, which does the sewing.

The heel is made of different lifts or layers of leather, cemented together. It is then placed under great pressure, which gives it exact form and makes it stronger. The counter, which stiffens the back part of the shoe, and the toe-box or stiffening, which is placed between the toe-cap and vamp, are made in the same room. When these are all completed, they are sent to the making or bottoming room, where the other parts have been brought.

ASSEMBLING THE PARTS

There a machine passes strong twine through the eyelets and ties it automatically. This keeps all the parts of the upper in their proper position while the shoe is being made. Another machine tacks the insole to the bottom of the last. A workman then places the toe-box and counter in their proper places, and draws the upper over the last.

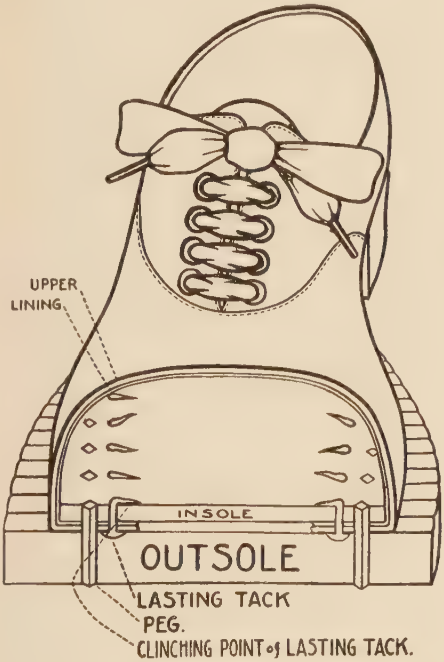
PULLING THE UPPER OVER THE LAST

A wonderful machine pulls the upper smoothly down to the last. The pincers of this machine grasp the leather at different points on each side of the toe. The operator, standing where he can see when the upper is placed exactly where it belongs, presses a foot lever, the pincers close and draw the leather securely against the wood of the last. By moving different levers the workman adjusts the shoe accurately, so that each part of it lies in the exact position intended for it when the shoe was designed. The operator again presses a foot-lever, the pincers move toward each other and draw the leather securely around the last. At the same time three tacks are driven automatically on each side and one at the toe, which hold the upper securely in position. These tacks are driven in only part way, so that they may afterwards be removed.

LASTING

The shoe is now ready for lasting. This is one of the most difficult and most important parts of the process, for upon the success of this operation largely depends the beauty and comfort of the shoe. Machines draw the leather tightly around the last, so that not a wrinkle is left anywhere, and also pull it down over the insole, where tacks hold it in place. These tacks are also driven in only part way, so that afterwards they may be removed and leave the inside of the shoe perfectly smooth.

The surplus leather around the insole is cut away and the edges made smooth. The leather and the counter around the heel are then pounded until the stiff portion conforms exactly to the shape of the last.

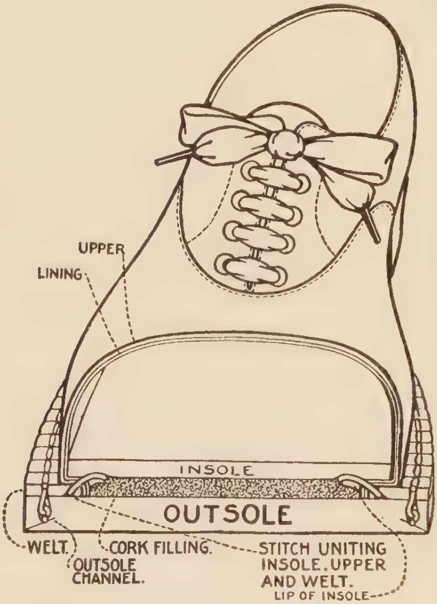


CROSS SECTION OF A PEGGED SHOE.

In this type of shoe the outsole is fastened to the insole by wooden pegs. The tacks used in lasting are driven way in and clinched against the steel bottom of the last. The ends of the pegs and tacks, which show on the inside, leave the surface rough.

SEWING ON THE WELT

The shoe is now ready to receive the welt, which is a narrow strip of leather that is sewed all along the edge of the shoe, except where the heel is placed. This welt is sewed from inside the lip of the insole, so that the curved needle passes through the lip, upper and welt, uniting all three securely and allowing the welt to protrude evenly along the edge. In making the stitch the needle does not go inside the shoe, but passes through only a portion of the insole, leaving the inside perfectly smooth. This part of the work was formerly one of the most difficult tasks in shoe-making. As it was done by hand, different operators sometimes made stitches of different lengths and different tensions. Such stitching did not wear well, because it did not hold the different parts of the shoe firmly together.



CROSS SECTION OF A WELT SHOE.

In this type of shoe the tacks used in lasting are all withdrawn and a machine with a curved needle sews the welt and shoe upper to the insole without going inside the shoe. The outsole is then stitched to the welt. By this method the inside is left perfectly smooth.

The invention of the Goodyear Welt Sewing Machine changed all this. Auguste Destouy had invented a curved needle machine for sewing outsoles to welts, but it was not successful until taken in hand by Charles Goodyear, son of the well-known inventor of India rubber fabrics. This device was first used in a machine for sewing "turn" shoes, but later was adapted by Mr. Goodyear in the famous sewing machine which bears his name. This machine has revolutionized the manufacture of shoes. It makes stitches of equal length, and measures them automatically, it draws the strong linen waxed thread evenly, and forms a stitch which holds the welt, upper and insole securely together.

After the sewing the surplus portions of the lip, upper and welt are trimmed off, and the welt is beaten so that it stands out evenly from the side of the shoe.

THE OUTSOLE

The insole and welt now receive a coating of rubber cement. The rubber makes the sole water-proof. A workman tacks the shank on the insole between the heel and forepart of the sole and fills the bottom with ground cork and rubber cement. The outside sole receives a coating of this cement on the flesh side, that is, the side next the animal. It is then pressed firmly on the bottom of the shoe, where it is held in place by the cement.

The whole shoe is now forced down into a rubber pad or mould, which has been shaped to the exact curve of the bottom of the shoe. By this process every part of the sole is pressed firmly against the bottom of the shoe and welt, and shaped to the desired curve. The outsole and welt are trimmed so that they protrude a uniform distance from the edge of the shoe.

SEWING THE OUTSOLE TO THE WELT

The outsole is then sewed to the welt by a machine which makes a lockstitch, which shows on the upper side of the welt after the shoe is finished. An automatic levelling machine rolls out any unevenness in the sole.

PLACING AND TRIMMING THE HEEL

The heel is now put on, the rough lifts are trimmed to the desired shape, and the breast of the heel is cut to the correct angle and curve. Then the edge of the insole is trimmed smoothly.

FINISHING AND POLISHING

The edges of the shoe and welt now receive a coating of special blacking, and every stitch on the upper side of the welt is made to show clearly. The heel is coated with a special ink, and brushed until its surface is bright. The bottom is blacked or stained and also brushed until it has a high gloss. The trade-mark, or trade-name of the manufacturer, is then stamped on the bottom or shank.

The finished shoe is now taken off the last and put on a shoe-tree. Every wrinkle is rubbed out, and three little creases are made across the vamp where it naturally creases when the shoe is bent. After a final brushing, the finished shoe is packed in a pasteboard box, ready for the wearer.

SIZES AND NUMBERS

Shoes are made in twenty-six different lengths, numbered in two series from one to thirteen. One-third of an inch is a size, that is, the difference in length between a number eight and a number nine shoe is one-third of an inch. Between most of the sizes, half sizes are made. Often there are five different widths for each size, A, B, C, D, and E. One twelfth of an inch is a width, as for example, the difference between a B and C width is one-twelfth of an inch.

HAND-MADE SHOES

Many people still have their shoes made by hand, because they believe hand-made shoes are superior to those made by machinery. Most hand-made shoes command a very high price, because of the fine material used and excellent workmanship. As it is, most hand-made shoes have the outsole stitched to the welt by a machine.

In the early days all the shoes were made by hand. The chief tools used were the hammer, lapstone, crude needle, knife and awl. In any shoe-repairing shop you may still see the shoemaker working with these tools. But within the last seventy years, machines have been invented for every important process in the manufacture of shoes, and large factories have been established where vast numbers of them are made every year.

NEW ENGLAND THE CENTRE OF SHOE-MANUFACTURING IN AMERICA

The first shoemaking recorded in America was by Thomas Baird, who arrived in 1629 on the second voyage of the Mayflower. He was engaged by the Plymouth Company to make shoes for the colonists. For this purpose he brought with him different kinds of hides and the various tools. It is recorded that a planter in Virginia in 1636 employed six shoemakers to make shoes for his slaves.

The making of shoes became such an important industry in the early history of the country, that laws were passed regulating it. In Pennsylvania, in 1721, drastic laws were passed regarding the making of shoes and fixing the price to be paid for them.

LYNN THE "CRADLE OF THE SHOE INDUSTRY"

Early in the history of New England, Lynn, Massachusetts, became a shoe-making centre. Philip Kertland, an experienced Welsh shoemaker, came there and taught his art to many of the colonists in the vicinity. In a few years Lynn was making most of the shoes then sold in Boston. John Adam Dagyr, another celebrated shoemaker, also settled there in 1750. He secured the best samples of work from abroad and taught many apprentices. The fame of New England shoes is largely due to the training given by these men.

LEARNING THE TRADE

Before the introduction of the shoemaking machinery, the young man who wanted to learn the trade was apprenticed for a term of seven years. He was instructed in every part of the trade, and, when he had served his time, he became a full-fledged shoemaker and started out for himself. He was called a journeyman, because he journeyed from place to place in search of work. A family needing shoes would engage him to come into their home to make shoes out of their home-tanned leather, and he would remain with them, working until he had made a year's supply of footwear for customers in this way. This was called "whipping the cat."

THE FACTORY SYSTEM

A master workman soon realized that he could increase his income greatly by employing other men to do certain portions of the work while he directed their efforts. This gradually led to a division of labour, and was the beginning of the factory system, which has steadily developed since that time.

In 1795 there were in Lynn, Massachusetts, more than two hundred workmen, employing over six hundred journeymen, or shoemakers who had learned the trade, and they manufactured shoes at the rate of about one pair a day per man. This work was done in little shops about ten feet square, usually located in back yards, where from three to eight men worked together. Factory buildings such as we have to-day were practically unknown at that time.

Work was often given out to women, who sewed the uppers of the shoes by hand in their homes. Lucy Larcom has given us a vivid picture of one of these workers in "Hannah Binding Shoes," from which the following verse is taken:

"Poor lone Hannah,
Sitting at the window, binding shoes!
Faded, wrinkled,
Sitting, stitching in a mournful muse!
Bright-eyed beauty once was she,
When the bloom was on the tree.
Spring and Winter
Hannah's at the window, binding shoes."

John Greenleaf Whittier, the Quaker poet of New England, was a shoemaker in his youth. He praised the gentle craft in a "Ballad to Shoemakers," and also wrote "Cobbler Keezar's Vision."

SHOE MACHINERY

Previous to 1845 there had been little change in the tools used, the lap-stone, the hammer, the crude knife and the awl being the most important. But in that year, a rolling machine was perfected, which took the place of the lap-stone and hammer, used by the shoemakers for making the leather tougher. By the use of this machine, a man could, in half an hour, obtain the same results as a workman could in a whole day, by the old method of pounding.

The first McKay Sewing Machine was established in Lynn in 1861. At that time there was a great demand for boots for soldiers engaged in the war. As the war also took many men from the shoe-making trade, more and more machinery was used. This increased demand for shoes and scarcity of labour led to many improvements in shoe-making machinery, the most important of which was the Goodyear Welt Sewing Machine, for which patents were obtained in 1871 and 1875. These patents were the beginning of the now famous Goodyear welt system of manufacturing shoes, but not until nearly twenty years later did the machine become really successful. Since that time one improvement has followed another, until it seems as if they had now reached perfection.

Many factories were built, chiefly at Brockton, Beverly, Haverhill, and Lynn, and were equipped with all the modern machinery. The industry steadily grew, until in 1912 Massachusetts alone manufactured forty-seven per cent. of all the shoes made in the United States. The shoe industry has become the fourth largest manufacturing industry in the country, and 1,000,000 pairs of boots and shoes are made daily. The American shoe is exported to all parts of the world, and generally recognized as the best.

SHOES OF OTHER PEOPLES AND OF OTHER TIMES.—THE SANDAL

From the earliest times men wore some form of foot-covering to protect their feet from the rough way or hot sands over which they had to travel in search of food and clothing.

The first foot-covering used was probably a simple form of sandal — a rough piece of hide, wood, or plaited grass, held to the foot by narrow strips of hide, brought up between the toes and tied about the ankle.

Later the sandal was developed and ornamented by the Greeks and Romans. Although this was their usual form of footwear, high boots were used for hunting and travelling.

Sandals are still worn whenever people remain in a primitive or semi-primitive state. They are also worn by a few orders of friars and by some peasants in Spain, Siberia and the Balkans. The Japanese wear a sandal with a felt sole, and remove it when they enter the house. Although the American shoe is recognized by the government as the official one, the people still cling to the sandal. The upper part or covering is made of many different fabrics.

THE INDIAN MOCCASIN AND ESKIMO BOOT

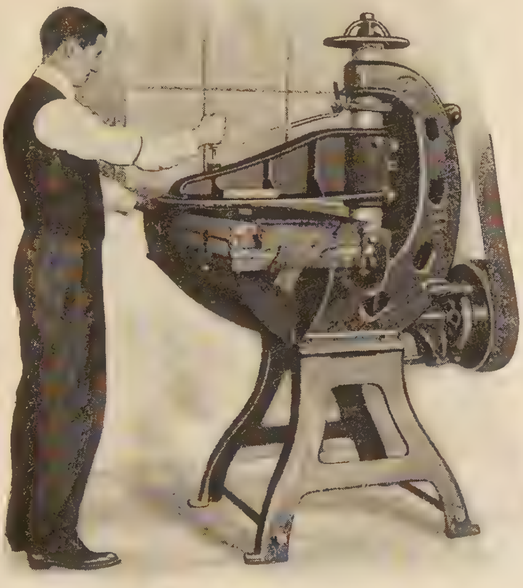
In cold climates, where more protection was necessary, more straps or thongs were used, but more often a bag-like covering was worn, like the Indian moccasin. The Eskimo wears a high boot, which is very loose at the top. It is made of the skins of animals, and is often lined with feathers.

HIGH SHOES OR BOOTS

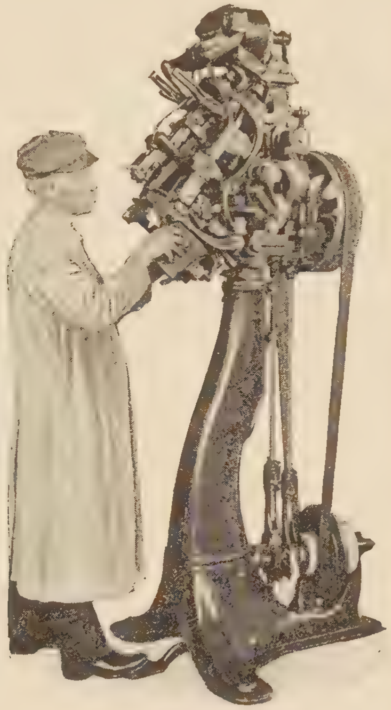
From the sandal, a foot covering was devised which covered not only the foot, but also the lower art of the leg. One form of heavy boot which reached above the knee, was called the Jack-boot, still worn occasionally by cavalrymen. Rubber boots of the same shape are now sometimes worn by fishermen and firemen.

After the fourteenth century shoes began to change their shape. Very long pointed toes became the fashion. The style ran to such extremes that laws had to be passed to stop it. Then the style ran to the other extreme, and the toes became very broad.

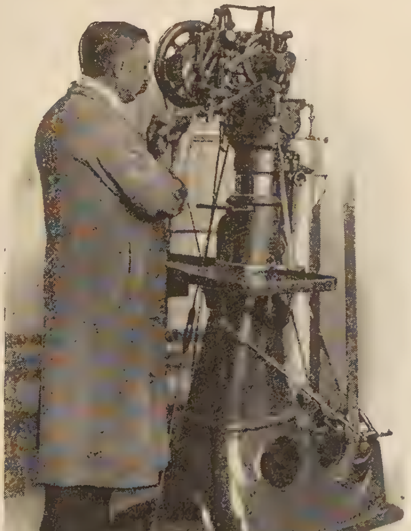
SOME MACHINES USED IN MAKING SHOES



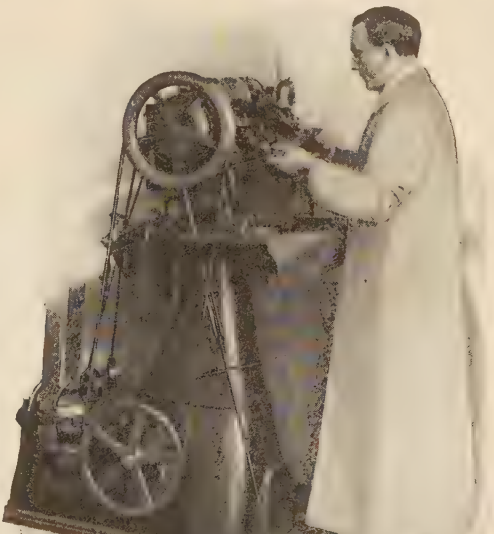
1



2



3



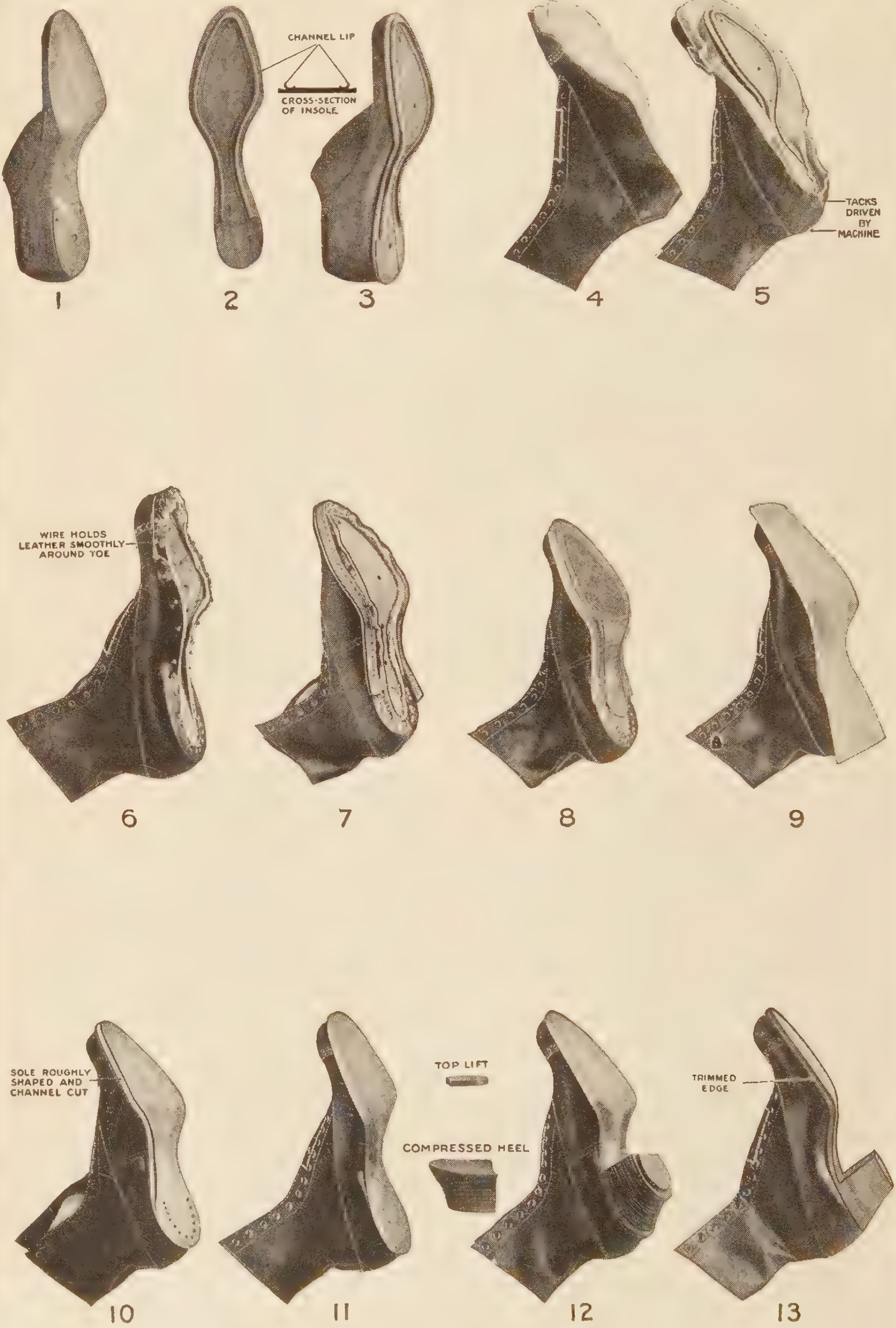
4

1. **The Ideal Clicking Machine** cuts out the parts of the upper according to patterns prepared beforehand.

3. The Welt and Turn Shoe Machine sews the welt to the insole and upper so that the insole can be placed.

2. The Rex Pulling-Over Machine draws the upper smoothly down over the last and fastens it firmly.

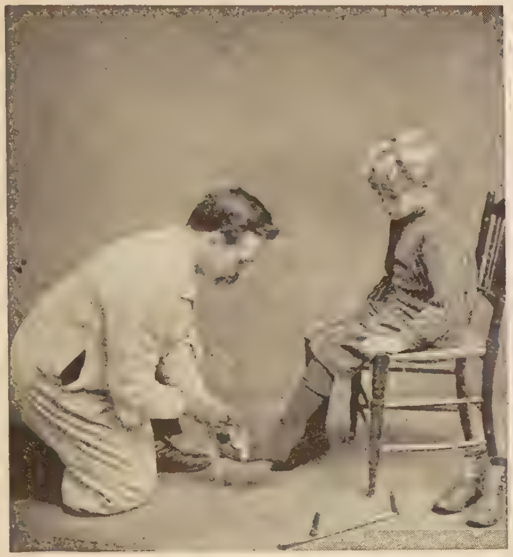
4. The Outside Rapid Lockstitch Machine sews the outsole to the welt. The work of this machine is shown in one of the smaller pictures on page 3099.



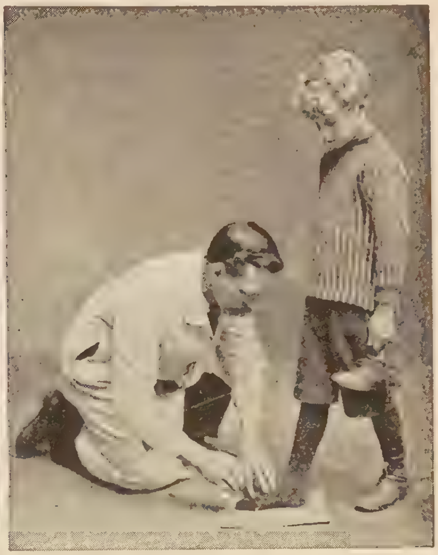
Pictures by courtesy of United Shoe Machinery Co.

1. Wooden last
2. Insole
3. Insole tacked on last and channel made
4. Upper
5. Upper on last
6. Upper tacked on
7. Welt sewed on
8. Shank placed
9. Outsole put on
10. Sole shaped and channel cut
11. Sole levelled
12. Heel put on
13. Heel trimmed

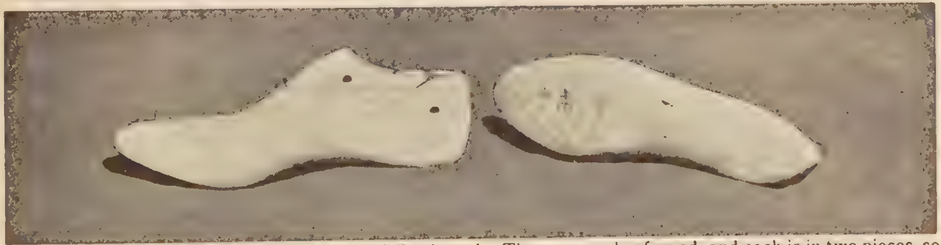
MAKING A PAIR OF SHOES BY HAND



The shoemaker finds the breadth of our foot with a tape measure, and the length is taken with a curious rule called a size-stick, like the one shown lying on the floor here.



He also measures round the instep, ankle, and leg, and then we have to stand upon a piece of paper while he marks round, with a pencil, the outline of our foot.

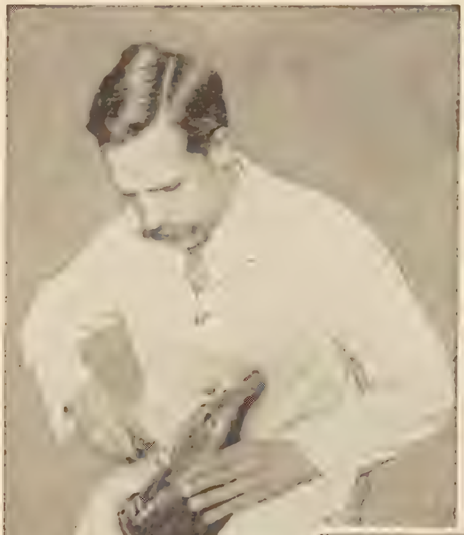


From these measurements the lasts are carefully shaped. They are made of wood, and each is in two pieces, so that it may be easily drawn out of the finished boot. Iron lasts are sometimes used for machine-made shoes.

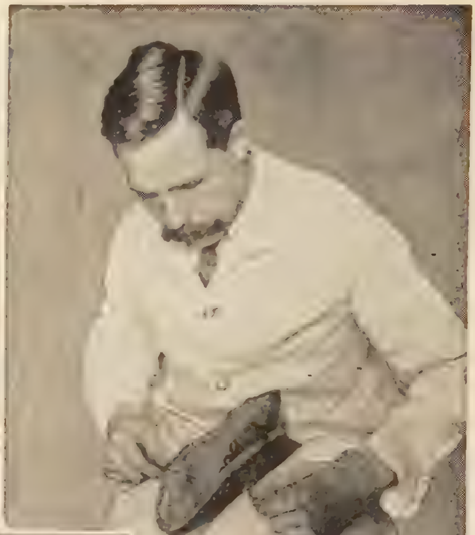
Now all is ready for the making of our shoes. First of all the uppers are cut out of a skin of leather by a man called a clicker, who uses a small sharp knife.

Then, after being fitted together and stuck with paste, the different parts of the uppers are sewn together by means of a sewing-machine, with needles made specially strong.

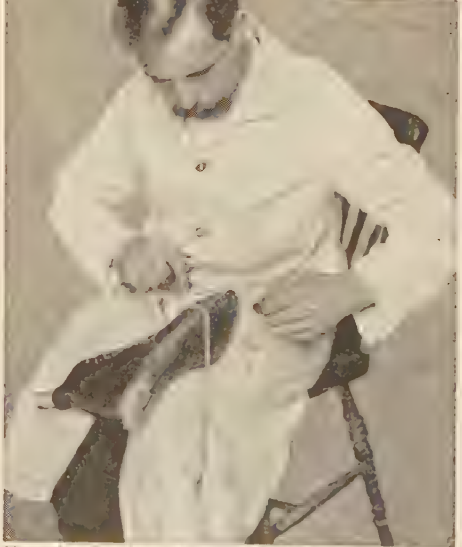
BUILDING UP A PAIR OF SHOES



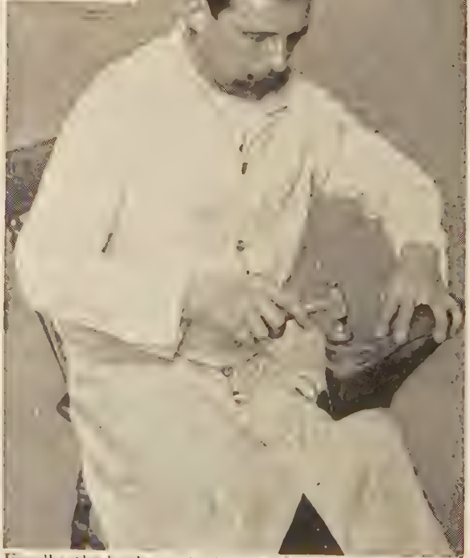
The upper is next lasted, or fitted round the last. The leather is pulled over the sole with a little pair of pincers, and tacked to the inner sole.



Then the welt, a narrow strap of leather to which the sole is fastened, is sewn on. In machine-made shoes the welt is attached in a different way.



Now the shoe is soled. Holding it in his lap the man makes holes with an awl through insole, upper, welt, and sole, and sews all together with waxed thread.



Finally, the heels are built up of layers of leather, the soles and heels are blackened and polished, the lasts are drawn out, laces are put in, and the shoes are ready.

THE NEXT PICTURES OF FAMILIAR THINGS ARE ON PAGE 3177

A SHOE WHICH MUST BE UNCOMFORTABLE

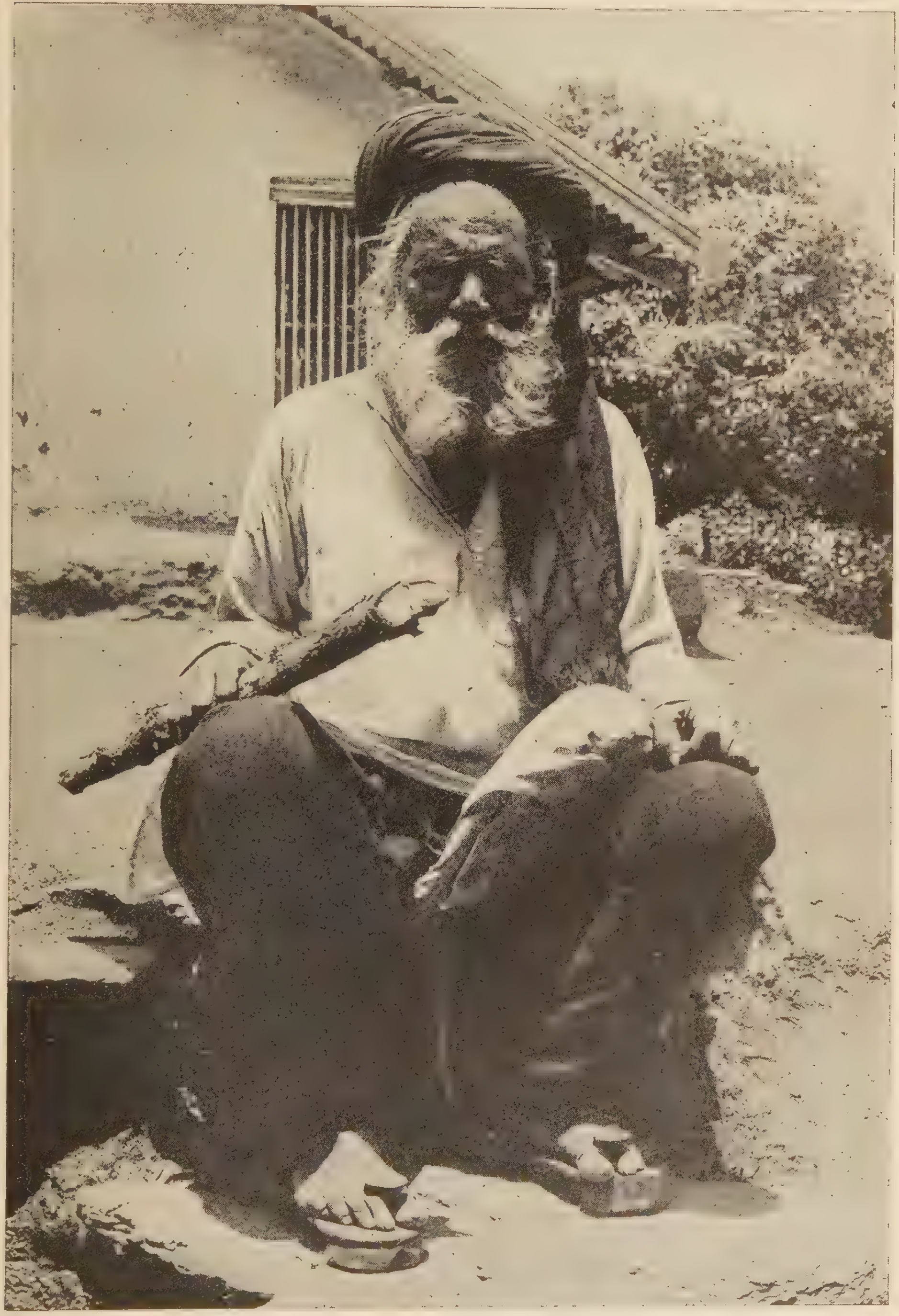


Photo copyright by Underwood & Underwood, New York.

This picture shows the kind of shoe worn by the lower classes in India. They are probably the oddest shoes in the world, being a flat block with a large knob which slips between the first and second toes. It would seem that they must be exceedingly clumsy and uncomfortable.

SOME QUEER SHOES WORN IN CHINA

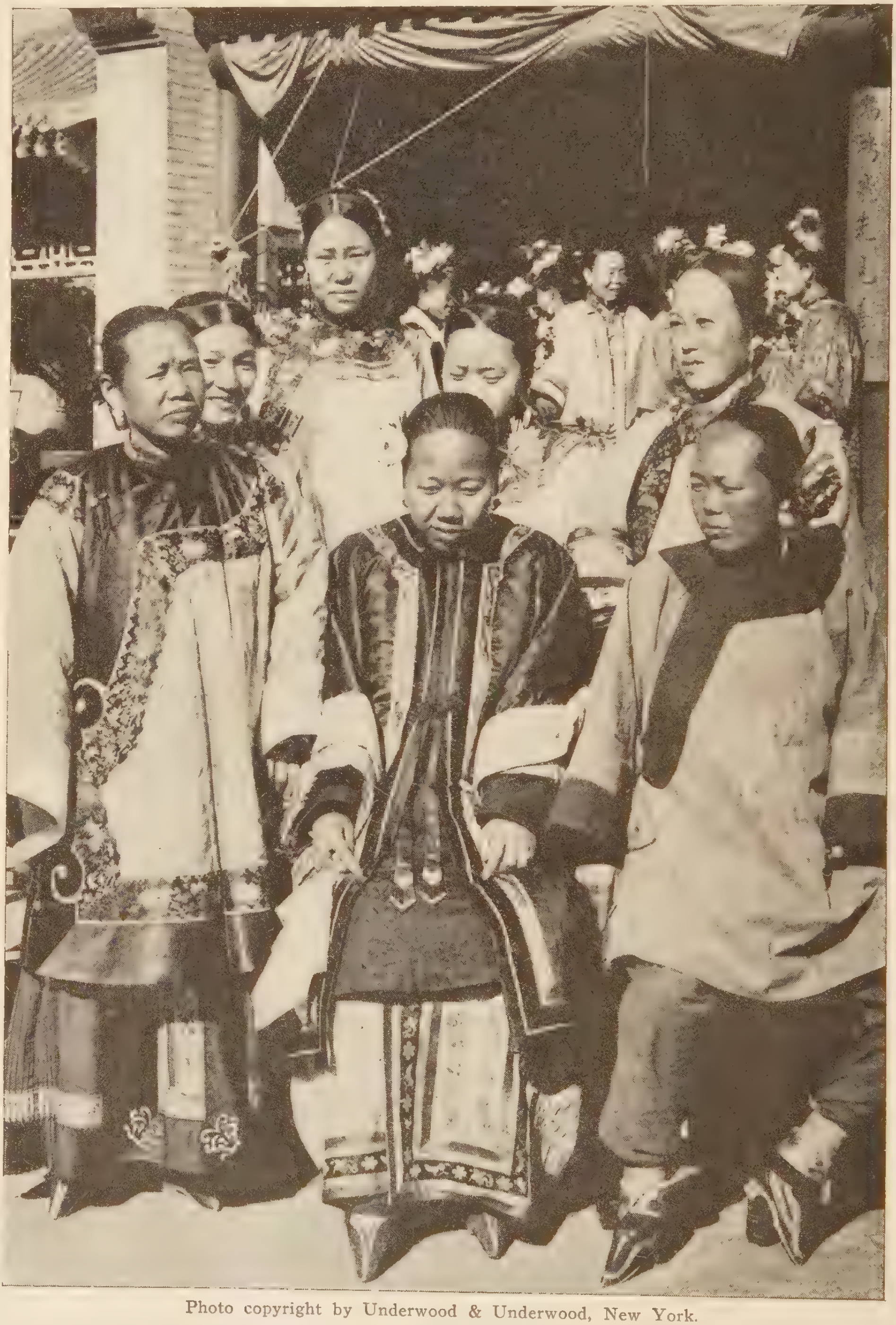


Photo copyright by Underwood & Underwood, New York.

In this picture you see the tiny shoes of fine kid and silk embroidery worn by Chinese ladies of the upper classes in Canton. Notice the peculiar shape and the high heels.

THE REAL VALUE OF FOODS

CONTINUED FROM 3048

A most important question, which we commonly forget to think about at all, though it is far more important than any food fad, is the question: How and when to eat. We have already been careful to learn the part that is played by the teeth in proper eating. We know how important that is, not only for itself, but because it starts the great chain of digestion. We need say nothing more about that here, provided that we do not forget it. But though the use of the teeth is the first part of the answer to the question, there are other things to learn.

As we know, the value of what we eat entirely depends upon the proper happening of what we call digestion, and digestion entirely depends upon the brain, just as breathing does, or the beating of the heart. Now, there are certain states of the brain in which digestion simply cannot occur. The food passes on, but wherever it goes, no digestive juices are poured out to meet it. Perhaps even it is not allowed to pass on, but is returned by the stomach, and we are sick. The wise stomach, knowing its duty as one of the guardians of the body, says to the food: "I cannot digest you, the brain will not allow me to do so; and I know that if I pass you on without having done my share of the work, a great deal of harm will be done. In fact, there is no good to be got from you, but only harm, and therefore I must do my very unpleasant duty of throwing you out." I wonder whether, when we are sick, we have ever thought of it from that point of view?

Now, our business is to learn what are those states of the brain and the mind in which eating can do us only harm. If we understand this question, we can protect ourselves by sensibly fasting for a little while. What is scarcely less important, we can protect other people at least to the extent that we shall not pester them to eat when they are not fit to eat. It is not wise to pester people in these states because the wise appetite fails on these occasions, and so a person who is not fit to digest is commonly protected from the bad effects which are bound to follow if food is put into his stomach. The pity is that we do not trust the appetite.

Now, if we were grown up, we should know what are the states of the brain and the mind in which one ought not to eat; or, at any rate, ought to eat only very lightly and carefully. But many children have no experience in themselves of the two great conditions, fatigue and worry, which arrest digestion, and in which it is positively harmful to eat. But though happy children may never have known what these words really mean, yet some day they will grow up, and it is well that they should study this question beforehand.

HOW WORRY AND FEAR CAN SPOIL OUR APPETITES

A man may sit down to his breakfast, consisting of the usual things which he is accustomed to eat with delight, fragrant coffee, hot, crisp toast, fresh eggs, and so on. But the smell of every one of these things, this particular morning, makes him feel sick and horrible. He must get away from the room, or he will be ill ; and yet that man is perfectly well, and just the same as he has always been, so far as anything that we can see is concerned. The explanation is that in the night he had to send for the doctor, and his mind is worried because he fears that he may lose the child he loves.

Now, that is an instance, and a terrible one, of the influence of worry, fear, anxiety, and such things upon the body. We have definite proof that in such cases the whole of the digestive processes of the body cease, and nothing can start them. We cannot learn too soon that our duty to ourselves or to others in such cases is to obey Nature. If it is necessary that food be taken, and that often comes to be the case with, for instance, a mother who is nursing a sick child, then the really wise doctor will pay as much attention to the feeding of the mother as to the feeding of the patient, and he will feed her on food that has been already digested outside the body. And so he may thus save his little patient.

Shakespeare, who had such a wonderful knowledge of things, understood this, and he puts into the mouth of the king, when he dismisses Wolsey, some words to the effect that Wolsey is to read the paper the king hands him, which contains his dismissal, and then to go and eat his breakfast, *if he can.*

THE TIRED BRAIN THAT MAKES EATING HARMFUL FOR US

Now, there is another state of the brain in which it is unwise to eat, because digestion is made impossible. That state is tiredness, or fatigue. It has been proved that when a person is tired, this is mainly because certain poisons, which he has himself made, are in his blood. Perhaps they have been made in his muscles, for he may have been working hard with his limbs ; but no matter where they have been made, these poisons are carried by his blood to his brain, and they produce in it the state which we call fatigue or tiredness. Now, such a brain cannot digest. It is possible to swallow various kinds of food when one is very tired, but the chances are high that they will only do harm. The remedy for fatigue is rest. A person who is desperately tired is not suffering from lack of food, he is not starved, which is quite a different thing ; if he were starved, the remedy would be food, but the remedy for fatigue is rest. In a little time the body will get rid of these poisons, and then the man's appetite will return, and with it his power of digestion.

For several years past there has been in various parts of the world a sort of craze for long-distance racing. Now, our business here is the study of the body, and long-distance running is full of interesting lessons about the human body.

RUNNING AND GAMES, AND WHAT THEY TEACH US ABOUT THE BODY

It is, of course, an experiment, and one of a very interesting kind, because in some ways it is a very natural experiment. Running is a thing for which the body is well fitted in many ways, and the very fact that children are so fond of running about teaches us that we can probably learn something very useful about the human body from running.

It would be easy to write a long and interesting book about running and games and athletic sports, and what they teach us about the body and the mind of human beings. But here we want to speak only about the question we are discussing—that is, the effect of tiredness on digestion. We were all interested in the famous Marathon race that was run in London in 1908, because several countries were competing, including our own, and some of us were particularly interested because we expected that the different sets of runners would have different theories about how to take care of themselves during a 26-mile race on a hot day. Now, when a man is running a race like that, for much honour and glory, he is to a certain extent worried and anxious, and in time, of course, the body becomes fatigued. Such a race is really a fatigue test. The man who gets tired last gets home first—apart from questions of judgment in running, and so on.

WHY WE SHOULD NOT EAT WHEN WE ARE TIRED

Now, those who study the body know that when there is both anxiety and fatigue, it is no time for eating. By all means drink water, which requires no digestion, and helps to flush the fatigue poisons out of the body, but do not let us make the absurd mistake of forcing ourselves to eat. The heart lies next to part of the stomach, and everything that disturbs the stomach will disturb the heart, and if the heart goes wrong there is an end to our running.

Well, now, what happened in the Marathon race ? It is very interesting to know, because on the average the same thing will always happen, and must always happen. After inquiry, which has been made very carefully, because an experiment like this is of great importance for science, we find that the facts are that the first Englishman to reach the goal arrived some twenty minutes or so after the winner.

Now, the Englishmen took various kinds of food on the way. They do not study such things much in England, and if one told the average English runner some of the facts which science has discovered about his muscles and his heart and his lungs, upon which all his running depends, he would probably want to know how fast his adviser could run, and would think that he did not know what he was talking about. Now, a large number of the American runners arrived in the front, including the winner.

AN IMPORTANT TRUTH THAT MARATHON RUNNERS DID NOT UNDERSTAND

The American team took no food during the race; the Italian runner also, who actually passed the tape first, took no food, but he believed in alcohol during a race, not knowing that one always has to pay a heavy price and very quickly, too, for the apparent good one gets out of alcohol. He paid his price by collapsing before he got to the tape, and he afterwards did the same thing over here. When we take a meal, it is about four and a half to six hours on the average before the valuable part of the food is prepared and passed into the blood. Until it gets into the blood it is doing no work for us, but, on the contrary, we are working upon it. Now, a Marathon race takes about three hours or less. So we may say that the English team would begin to get some good out of the food they had taken about two hours after the race was over. In point of fact, it is more likely that, what with anxiety and fatigue, they would never get any good out of that food. During the race it lay undigested in their stomachs, and merely hampered the working of the heart, which is what a runner really runs with, if he knew.

Now, long-distance running is only a sport, and by no means the best of sports, because it is selfish. But this ignorance of the truths about the body, which showed itself among the Englishmen in this race, shows itself also in a much bigger race which the British nation is running with the German nation and the American nation and the Japanese nation to-day.

THE KNOWLEDGE THAT HELPS, AND THE KNOWLEDGE THAT IS OF NO USE

Though we won the race, nevertheless, in spite of all we spend on education, we are not yet teaching ourselves or our children the great lessons of Nature—the mighty mother of all real wisdom. All over the country, not in single cases, but in millions of cases, we are doing more foolish things than the English runners who ate food that required twice as long to digest as the race took to run. All over the country, boys and girls are learning the names of the kings of Israel and the height of Mount Everest, and the name of the English king who died of eating too many lampreys, while their mouths are full of decaying teeth of which they never think, which they have never learnt to use, for which no one does anything, and yet the happiness, the usefulness, and worth of their future lives largely depend upon these very teeth which are being allowed to decay while the boy or girl learns the names of many things which are not at all important.

Let us hope that, when we who are children, and who are reading this book, grow up, we shall understand that all living creatures are parts of Nature;

that there are no laws or facts of Nature which do not matter; that if we are to command Nature, and use her for our own human purposes, we must command her by obeying her, as Bacon said. We might think, perhaps, that lessons like these were not to be learnt from such a humble thing as the stomach, but there is nothing in the world that is common or unclean, and, as Tennyson tells us, if we understand all there is to know about only the smallest flower, we shall know more about ourselves and about God.

We have now learnt when not to eat, and why we should not eat then. It is to be added that when we have a cold, and often also in very hot weather, our appetite fails. It does this for a good reason, and we shall be wise to obey it. But there is another important point about when to eat. Our appetite cannot always foretell exactly how much we shall like. This is especially true with children, who often ask for a large helping, and then cannot eat it all. We ought to learn not to be greedy, and we ought to think twice before we force food down; it is very likely that it will not be digested, and sometimes, when people do this with foods that are really valuable, they simply get a dislike for them, and that is a pity.

HOW THE BLOOD NEEDS FOOD AND CALLS TILL IT IS SATISFIED

When we come to study the appetite very carefully, we find that it is by no means entirely due to feelings from the stomach. The bottom reason of real hunger is the state of the blood. Now, we have already learnt that it takes some hours for the food to pass into the blood. So a man may have swallowed quite enough food to satisfy his blood when it gets there, but until the food gets there the blood is still crying for more. This sort of thing happens every day, both to grown-up people and to children. They go on eating until they come to the very end of their appetite. If they were wiser, they would stop when they feel quite capable of going on, and still have a little appetite left. That feeling of hunger will pass away when the food gets into the blood.

Probably the reason why healthy people have rather more appetite than they really need in these days is that our ancestors, long ago, when men were wild, were not always sure where their next meal was coming from, and needed good appetites to deal with a meal when they got the chance. The case is very different now, when our meals come regularly, whether we need them or not. This has its good side, but it is also apt to have its bad side, which we can study equally well in ourselves, or in the domestic animals for whom we make the same unnatural arrangement.

THE IMPORTANCE OF APPETITE AND WHY IT MUST BE CONTROLLED

Now, we have been saying a great deal about appetite, but not a word too much. The appetites of human beings, for all sorts of things and not only for food, are among the most important things about us. It is mainly these various appetites that make us do things at all, rightly or wrongly, and the great defect of most that is written or taught about food is that the appetite is forgotten or misunderstood. Now we must go on to study some special foods, never forgetting that milk and bread have their own special precious place which other foods cannot compete with, and that therefore we have learnt about them first, and must never forget about them. Let us first make a note about some of the foods that cost more than they are worth. That, of course, is true of a great many foods, but many of them we know to be luxuries, and make no mistake about. There are others, however, which are very dear in proportion to their worth, and yet have a really high reputation as foods.

First of all, let us take fish, and let us notice that the difference in price between, say, cod and halibut, and in general, between one kind of fish and another, is entirely a matter of flavour. As long as fish is fresh, or properly salted or smoked, it matters little what fish we are eating. Everything considered, even including the question of flavour, the herring must take the first place among all the fishes that mankind uses.

THE KINDS OF FISH THAT ARE BEST FOR FOOD

It must not, of course, be supposed that other fish are not good also, but the herring beats them all on the score of cost; it is very digestible, and has a very good flavour. Different kinds of fish vary in the amount of fat they contain, and, as a rule, the less fat, the more digestible they are. Cod, whiting, and haddock contain least fat of all. But, of course, fat is very good if one can digest it. No more need be said about this here. Simply we are to remember that whenever we pay more for a given weight of fish than we have to pay for that weight of the cheap fishes, such as herring, we are merely spending money for a nice taste.

THINGS THAT ARE GOOD FOR INVALIDS, BUT BAD FOR HEALTHY PEOPLE

Healthy people, also, are almost throwing their money away when they take meat extracts. Taken with hot water, these things have a stimulating action, though probably not very much more than the hot water itself has. But, as Baron Liebig himself said many years ago, they are not foods. For people who are ill, and whose appetite is also ill, meat extract and beef-tea are often very useful, because they help the appetite; but it is a great mistake to give these things to children, who ought to need neither stimulants nor fillips to the appetite. If we were really meant to require mustard and pepper, and so on, Nature would not have forgotten things of that kind when she made her food, which is milk.

When meat extracts are made, the substance of the muscle fibres is all left behind. This substance can be prepared and made into a meat juice, and so on, and is a true food, though very expensive. But the stuff that goes into the meat extract contains very little food of any kind. If we make experiments on animals, we find that animals fed on beef extract die of starvation as quickly as animals that are not fed at all. That is a cruel experiment, but whether or not men were justified in making it, that is the result of it. The secret of the success of meat extracts and the public faith in them is that they get out of the muscle fibre everything that has a taste —everything, indeed, except the food itself, and it is the taste that cheats us.

THE COST OF FOOD IS NOT REALLY ACCORDING TO ITS VALUE

Cocoa is a food for which some good may be said; it helps many people to drink milk, but we ought to regard it as highly expensive, as it really is, in proportion to the food material it actually contains. We must discuss its properties later. In studying the cost of food in proportion to its food-value, we should always be ready to assume that directly the price begins to go up, we are paying, not for food, but for flavour. The products of wheat-flour and of oatmeal ought to rank as the standard for cheapness. We know their splendid food-value. In the same way, in places near the sea the cod or herring ought to rank as the standard. When we pay more than these fish cost, either for other kinds of fish or for meat, or for game or for poultry, we are paying for flavour. This is not to say that we ought not to pay for flavour, but it is simply stating a scientific fact that everybody ought to know.

It is a very important matter, from the national point of view, that when we put taxes on articles, or when we take them off, we should know what those articles are worth for the life of the people. For instance, everyone agrees that it is right to tax alcohol highly, because it is not a necessary of life. It may or may not be right to tax wheat, but at least we ought to know what we are doing. To-day many nations place substantial taxes on alcohol, tobacco, tea, and coffee, and these are often described as taxes on food. This is a very serious error, for none of these things has any food-value.

TEA AND COFFEE AND OTHER THINGS THAT ARE NOT REAL FOODS

Though they are not foods, yet alcohol, tobacco, tea, and coffee are extremely important things in the life of a nation, for it consumes gigantic quantities of all of them, and every one of them stands for powerful chemical substances with various kinds of effects upon the body; some which we must call good, others bad, and others, so far as we can find out, neither good nor bad. We shall have to study these things very soon, but before that we must learn some more about the real foods, beginning with meat, of which we also consume large quantities, and about which there is a great deal that we ought to know.

At the zoos we find animals that will not eat anything but meat, and others that will not touch it. Yet in both cases the animals may be healthy and strong, so that eating meat is not a matter of life and death, as some people seem to fancy. Still, this is a very important question, as we shall see—if for no other reason than that meat is a dear food.

The next part of this is on page 3213.

THE TRIAL OF THE KNAVE OF HEARTS

The King and Queen of Hearts were seated on their throne, with a great crowd assembled about them. In the very middle of the court was a table, with a large dish of tarts upon it. The first witness was the Hatter. He came in with a teacup in one hand and a piece of bread and butter in the other. "I beg pardon, your Majesty," he began, "for bringing these in; but I hadn't quite finished my tea when I was sent for." The Queen put on her spectacles, and began staring hard at the Hatter, who turned pale and fidgeted. "Give your evidence," said the King; "and don't be nervous, or I'll have you executed on the spot."

ALICE'S ADVENTURES IN WONDERLAND

We left Alice just after she got up and walked away from the Mad Tea-Party. It will be remembered that the behaviour of the Hatter was altogether so rude that after she had tolerated his conduct for quite a long time she felt that she had to show him and the March Hare what she thought of them, by rising up and taking an abrupt leave of the party. As she went away they were trying to put the Dormouse in the teapot! Making her way through the wood, she vowed never to go there again. Her purpose was now to get into the beautiful garden, and this at last she managed to do. The adventures that befell her there are told in the following pages.

ALICE & THE QUEEN OF HEARTS

With the Mock Turtle's Story and the Lobster Quadrille

CONTINUED FROM 3062

Alice got into the beautiful garden at last, but she had to nibble a bit of the mushroom again to bring herself down to twelve inches after she had got the golden key, so as to get through the little door. It was a lovely garden, and in it was the Queen's croquet-ground. The Queen of Hearts was very fond of ordering heads to be cut off. "Off with his head!" was her favourite phrase whenever anybody displeased her. She asked Alice to play croquet with her, but they had no rules; they had live flamingoes for mallets, and the soldiers had to stand on their hands and feet to form the hoops. It was extremely awkward, especially as the balls were hedgehogs, who sometimes rolled away without being hit. The Queen had a great quarrel with the Duchess, and wanted to take her head off. Alice found the state of affairs in the lovely garden not all so beautiful as she had expected. But after the game of croquet, the Queen said to Alice:

"Have you seen the Mock Turtle yet?"

"No," said Alice. "I don't even know what a mock turtle is."

"It's the thing mock turtle soup is made from," said the Queen.

"I never saw one or heard of one," said Alice.

"Come on, then," said the Queen, "and he shall tell you his history."

As they walked off together, Alice heard the King say in a low voice to the company generally: "You are all pardoned."

"Come, *that's* a good thing!" she said to herself, for she had felt quite unhappy at the number of executions the Queen had ordered.

They very soon came upon a gryphon, lying fast asleep in the sun.

"Up, lazy thing!" said the Queen; "and take this young lady to see the Mock Turtle, and to hear his history. I must go back and see after some executions I have ordered." And she walked off, leaving Alice alone with the Gryphon.

Alice did not quite like the look of the creature, but, on the whole, she thought it would be quite as safe to stay with it as to go after that savage Queen; so she waited.

The Gryphon sat up and rubbed its eyes; then it watched the Queen till she was out of sight, then it chuckled.

"What fun!" said the Gryphon, half to itself, half to Alice.

"What *is* the fun?" said Alice.

"Why, *she*," said the Gryphon. "It's all her fancy, that; they never executes nobody, you know. Come on!"

"Everybody says 'Come on' here," thought Alice, as she went slowly after it. "I never was so ordered about before in all my life, never!"

They had not gone far before they saw the Mock Turtle in the distance, sitting sad and lonely on a little ledge of rock, and, as they came nearer,

"Off with his head!" was the favourite phrase of the Queen of Hearts whenever anybody displeased her. She asked Alice to play croquet with her; but they followed no rules; they had live flamingoes for mallets, and the balls were living hedgehogs rolled up, who sometimes moved away without being hit.

Alice could hear him sighing as if his heart would break. She pitied him deeply.

"What is his sorrow?" she asked the Gryphon, and the Gryphon answered, very nearly in the same words as before:

"It's all his fancy, that. He hasn't got no sorrow, you know. Come on!"

So they went up to the Mock Turtle, who looked at them with large eyes full of tears, but said nothing.

"This here young lady," said the Gryphon, "she wants for to know your history, she do."

"I'll tell it her," said the Mock Turtle in a deep, hollow tone. "Sit down, both of you, and don't speak a word till I've finished."

So they sat down, and nobody spoke for some minutes. Alice thought to herself: "I don't see how he can *ever* finish if he doesn't begin." But she waited patiently.

"Once," said the Mock Turtle at last, with a deep sigh, "I was a real turtle."

These words were followed by a very long silence, broken only by an occasional exclamation of "Hjckrrh!" from the Gryphon, and the constant, heavy sobbing of the Mock Turtle. Alice was very nearly getting up and saying: "Thank you, sir, for your interesting story," but she could not help thinking there *must* be more to come, so she sat still and said nothing.

"When we were little," the Mock Turtle went on at last, more calmly, though still sobbing a little now and then, "we went to school in the sea. The master was an old turtle—we used to call him Tortoise——"

"Why did you call him Tortoise if he wasn't one?" Alice asked.

"We called him Tortoise because he taught us," said the Mock Turtle angrily. "Really, you are very dull!"

"You ought to be ashamed of yourself for asking such a simple question," added the Gryphon; and then they both sat silent and looked at poor Alice, who felt ready to sink into the earth. At last the Gryphon said to the Mock Turtle:

"Drive on, old fellow! Don't be all day about it!" And he went on in these words:

"Yes, we went to school in the sea, though you mayn't believe it——"

"I never said I didn't!" interrupted Alice.

"You did!" said the Mock Turtle.

"Hold your tongue!" added the Gryphon, before Alice could speak again. The Mock Turtle went on:

"We had the best of educations—in fact, we went to school every day——"

"*I've* been to a day-school, too," said Alice. "You needn't be so proud as all that."

"With extras?" asked the Mock Turtle a little anxiously.

"Yes," said Alice; "we learned French and music."

"And washing?" said the Mock Turtle.

"Certainly not!" said Alice indignantly.

"Ah, then yours wasn't a really good school!" said the Mock Turtle, in a tone of great relief. "Now, at *ours* they had at the end of the bill, 'French, music, *and washing*—extra.'"

"You couldn't have wanted it much, living at the bottom of the sea."

"I couldn't afford to learn it," said the Mock Turtle, with a sigh. "I only took the regular course."

"What was that?" inquired Alice.

"Reeling and Writhing, of course, to begin with," the Mock Turtle replied; "and then the different branches of Arithmetic—Ambition, Distraction, Uglification, and Derision."

"I never heard of 'Uglification,'" Alice ventured to say. "What is it?"

The Gryphon lifted up both its paws in surprise.

"Never heard of uglifying!" it exclaimed. "You know what to beautify is, I suppose?"

"Yes," said Alice doubtfully; "it means — to — make — anything — prettier."

"Well, then," the Gryphon went on, "if you don't know what to uglify is, you *are* a simpleton."

Alice did not feel encouraged to ask any more questions about it, so she turned to the Mock Turtle, and said: "What else had you to learn?"

"Well, there was Mystery," the Mock Turtle replied, counting off the subjects on his flappers—"Mystery, ancient and modern, with Seaography; then Drawling—the Drawling-master was an old conger-eel, that used to come

THE MOCK TURTLE TELLS HIS STORY TO ALICE AND THE GRYPHON

"Once," said the Mock Turtle, with a deep sigh, "I was a real turtle." These words were followed by a very long silence, broken only by an occasional exclamation of "Hjckrrh!" from the Gryphon, and the constant, heavy sobbing of the Turtle. Alice was very nearly getting up and saying: "Thank you, sir, for your interesting story," but she could not help thinking there *must* be more to come, so she sat still and said nothing.

once a week; *he* taught us Drawling, Stretching, and Fainting in Coils."

"What was *that* like?" said Alice.

"Well, I can't show it you myself," the Mock Turtle said; "I'm too stiff. And the Gryphon never learnt it."

"Hadn't time," said the Gryphon. "I went to the Classical master, though. He was an old crab, *he* was."

"I never went to him," the Mock Turtle said, with a sigh. "He taught Laughing and Grief, they used to say."

"So he did, so he did," said the Gryphon, sighing in its turn. And both creatures hid their faces in their paws.

"And how many hours a day did you do lessons?" said Alice, in a hurry to change the subject.

"Ten hours the first day," said the Mock Turtle; "nine the next, and so on."

"What a curious plan!" exclaimed Alice.

"That's the reason they're called lessons," the Gryphon remarked; "because they lessen from day to day."

This was quite a new idea to Alice, and she thought it over a little before she made her next remark.

"Then the eleventh day must have been a holiday?"

"Of course it was," said the Mock Turtle.

"And how did you manage on the twelfth?" Alice went on eagerly.

"That's enough about lessons," the Gryphon interrupted, in a very decided tone. "Tell her something about the games now."

The Mock Turtle sighed deeply, and drew the back of one flapper across his eyes. He looked at Alice, and tried to speak; but for a minute or two sobs choked his voice.

"Same as if he had a bone in his throat," said the Gryphon, and it set to work shaking him and punching him in the back.

At last the Mock Turtle recovered his voice, and, with tears running down his cheeks, he went on again:

"You may not have lived much under the sea"—"I haven't," said Alice—"and perhaps you were never even introduced to a lobster" (Alice began to say, "I once tasted——" but checked herself, and said, "No, never")"so you can have no idea what a delightful thing a Lobster Quadrille is!"

"No, indeed," said Alice. "What sort of a dance is it?"

"Why," said the Gryphon, "you first form into a line along the sea-shore——"

"Two lines!" cried the Mock Turtle. "Seals, turtles, salmon, and so on. Then when you've cleared all the jelly-fish out of the way——"

"*That* generally takes some time," interrupted the Gryphon.

"You advance twice——"

"Each with a lobster as a partner!" cried the Gryphon.

"Of course," the Mock Turtle said. "Advance twice, set to partners——"

"Change lobsters, and retire in same order," continued the Gryphon.

"Then, you know," the Mock Turtle went on, "you throw the——"

"The lobsters!" shouted the Gryphon, with a bound into the air.

"As far out to sea as you can——"

"Swim after them!" screamed the Gryphon.

"Turn a somersault in the sea!" cried the Mock Turtle, capering wildly about.

"Change lobsters again!" yelled the Gryphon, at the top of its voice.

"Back to land again, and—that's all the first figure," said the Mock Turtle, suddenly dropping his voice. And the two creatures, who had been jumping about like mad things all this time, sat down again very sadly and quietly, and looked at Alice.

"It must be a very pretty dance," said Alice timidly.

"Would you like to see a little of it?" said the Mock Turtle.

"Very much indeed," said Alice.

"Come, let's try the first figure," said the Mock Turtle to the Gryphon. "We can do without lobsters, you know. Which shall sing?"

"Oh, *you* sing!" said the Gryphon. "I've forgotten the words."

So they began solemnly dancing round and round Alice, every now and then treading on her toes when they passed too close, and waving their fore-paws to mark the time; while the Mock Turtle sang this, very slowly and sadly:

"Will you walk a little faster?" said a whiting to a snail,
"There's a porpoise close behind us, and he's treading on my tail.

"Come, let's try the first figure," said the Mock Turtle to the Gryphon. "We can do without lobsters, you know." So they began solemnly dancing round Alice, every now and then treading on her toes when they passed too close, and waving their fore-paws to mark the time; while the Mock Turtle sang very slowly and sadly.

See how eagerly the lobsters and the turtles all advance!
They are waiting on the shingle—will you come and join the dance?
Will you, won't you, will you, won't you, will you join the dance?
Will you, won't you, will you, won't you, won't you join the dance?
"You can really have no notion how delightful it will be
When they take us up and throw us, with the lobsters, out to sea!"
But the snail replied "Too far, too far!" and gave a look askance—
Said he thanked the whiting kindly, but he would not join the dance.
Would not, could not, would not, could not, would not join the dance.
Would not, could not, would not, could not, could not join the dance.
"What matters it how far we go?" his scaly friend replied,
"There is another shore, you know, upon the other side.
The further off from England the nearer is to France—
Then turn not pale, beloved snail, but come and join the dance.
Will you, won't you, will you, won't you, will you join the dance?
Will you, won't you, will you, won't you, won't you join the dance?"

"Thank you; it's a very interesting dance to watch," said Alice, feeling very glad that it was over at last. "And I do so like that curious song about the whiting."

"Oh, as to the whiting," said the Mock Turtle, "they—— You've seen them, of course?"

"Yes," said Alice; "I've often seen them at dinn——"

She checked herself hastily.

"I don't know where Dinn may be," said the Mock Turtle; "but if you've seen them so often, of course you know what they're like."

"I believe so," Alice replied thoughtfully. "They have their tails in their mouths, and they're all over crumbs."

"You're wrong about the crumbs," said the Mock Turtle. "Crumbs would all wash off in the sea. But they *have* their tails in their mouths; and the reason is——" Here the Mock Turtle yawned and shut his eyes. "Tell her about the reason, and all that," he said to the Gryphon.

"The reason is," said the Gryphon, "that they *would* go with the lobsters to the dance. So they got thrown out to sea. So they had to fall a long way. So they got their tails fast in their mouths. So they couldn't get them out again. That's all."

"Thank you," said Alice, "it's very interesting. I never knew so much about a whiting before."

"I can tell you more than that, if you like," said the Gryphon. "Do you know why it's called a whiting?"

"I never thought about it," said Alice. "Why?"

"*It does the boots and shoes*," the Gryphon replied very solemnly.

Alice was thoroughly puzzled. "Does the boots and shoes!" she repeated in a wondering tone.

"Why, what are *your* shoes done with?" said the Gryphon. "I mean, what makes them so shiny?"

Alice looked down at them, and considered a little before she gave her answer. "They're done with blacking, I believe."

"Boots and shoes under the sea," the Gryphon went on in a deep voice, "are done with whiting. Now you know."

"And what are they made of?" Alice asked, in a tone of great curiosity

"Soles and eels, of course," the Gryphon replied rather impatiently. "Any shrimp could have told you that."

"If I'd been the whiting," said Alice, whose thoughts were still running on the song, "I'd have said to the porpoise: 'Keep back, please; we don't want *you* with us.'"

"They were obliged to have him with them," the Mock Turtle said. "No wise fish would go anywhere without a porpoise."

"Wouldn't it, really?" said Alice, in a tone of great surprise.

"Of course not!" said the Mock Turtle. "Why, if a fish came to *me*, and told me he was going on a journey, I should say: 'With what porpoise?'"

"Don't you mean 'purpose'?" said Alice.

"I mean what I say," the Mock Turtle replied in an offended tone. And the Gryphon added: "Come, let's hear some of *your* adventures."

"I could tell you my adventures, beginning from this morning," said Alice, a little timidly; "but it's no use going back to yesterday, because I was a different person then."

"Explain all that," said the Mock Turtle.

"No, no; the adventures first!" said the Gryphon impatiently. "Explanations take such a dreadful time."

So Alice began telling them her adventures from the time when she first saw the White Rabbit. After a while a cry of "The trial's beginning!" was heard in the distance.

"Come on!" cried the Gryphon. And, taking Alice by the hand, it hurried off. . . . "What trial is it?" Alice panted, as she ran, but the Gryphon only answered: "Come on!" and ran the faster.

The King and Queen of Hearts were seated on their throne when they arrived, with a great crowd assembled about them—all sorts of little birds and beasts, as well as the whole pack of cards. The Knave was standing before them, in chains, with a soldier on each side to guard him; and near the King was the White Rabbit, with a trumpet in one hand, and a scroll of parchment in the other. In the very middle of the court was a table, with a large dish of tarts upon it. They looked so good that it made Alice quite hungry to look at them. "I wish they'd get the trial done," she thought, "and hand round the refreshments." But there seemed to be no chance of this, so she began looking at everything about her to pass away the time. . . .

The twelve jurors were all writing very busily on slates. "What are they doing?" Alice whispered to the Gryphon. "They can't have anything to put down yet, before the trial's begun."

"They're putting down their names," the Gryphon whispered in reply, "for fear they should forget them before the end of the trial."

"Stupid things!" Alice began in a loud, indignant voice, but she stopped herself hastily, for the White Rabbit cried out: "Silence in the court!" and the King put on his spectacles and looked anxiously round, to make out who was talking.

Alice could see, as well as if she were looking over their shoulders, that all the jurors were writing down "stupid things!" on their slates, and she could even make out that one of them didn't know how to spell "stupid," and that he had to ask his neighbour to tell him. "A nice muddle their slates 'll be in before the trial's over!" thought Alice.

One of the jurors had a pencil that squeaked. This, of course, Alice could *not* stand, and she went round the court and got behind him, and very soon found an opportunity of taking it away. She did it so quickly that the poor little juror (it was Bill, the Lizard) could not make out at all what had become of it; so, after hunting all about for it, he was obliged to write with one finger for the rest of the day. And this was of very little use, as it left no mark on the slate.

THE KNAVE OF HEARTS WHO STOLE THE TARTS

"Herald, read the accusation!" said the King.

On this the White Rabbit blew three blasts on the trumpet, and then unrolled the parchment scroll, and read as follows:

"The Queen of Hearts, she made some tarts
All on a summer's day;
The Knave of Hearts, he stole those tarts,
And took them quite away."

"Consider your verdict," the King said to the jury.

"Not yet, not yet!" the Rabbit hastily interrupted. "There's a great deal to come before that!"

"Call the first witness," said the King; and the White Rabbit blew three blasts on the trumpet, and called out: "First witness!"

The first witness was the Hatter. He came in with a teacup in one hand and a piece of bread and butter in the other. "I beg pardon, your Majesty," he began, "for bringing these in; but I hadn't quite finished my tea when I was sent for."

"You ought to have finished," said the King. "When did you begin?"

The Hatter looked at the March Hare, who had followed him into the court, arm in arm with the Dormouse. "Fourteenth of March, I *think* it was," he said.

"Fifteenth," said the March Hare.

"Sixteenth," added the Dormouse.

"Write that down," the King said to the jury; and the jury eagerly wrote down all three dates on their slates, and then added them up, and reduced the answer to shillings and pence.

"Take off your hat," the King said to the Hatter.

"It isn't mine," said the Hatter.

"*Stolen!*" the King exclaimed, turning to the jury, who instantly made a memorandum of the fact.

"I keep them to sell," the Hatter added as an explanation; "I've none of my own. I'm a hatter."

Here the Queen put on her spectacles, and began staring hard at the Hatter, who turned pale and fidgeted.

"Give your evidence," said the King; "and don't be nervous, or I'll have you executed on the spot."

This did not seem to encourage the witness at all; he kept shifting from one foot to the other, looking uneasily at the Queen, and in his confusion he bit a large piece out of his teacup instead of the bread and butter.

Just at this moment Alice felt a very

curious sensation, which puzzled her a good deal until she made out what it was. She was beginning to grow larger again, and she thought at first she would get up and leave the court; but on second thoughts she decided to remain where she was as long as there was room for her.

"I wish you wouldn't squeeze so," said the Dormouse, who was sitting next to her. "I can hardly breathe."

"I can't help it," said Alice very meekly; "I'm growing."

"You've no right to grow *here*," said the Dormouse.

"Don't talk nonsense," said Alice more boldly; "you know you're growing, too."

"Yes, but *I* grow at a reasonable pace," said the Dormouse, "not in that ridiculous fashion." And he got up very sulkily and crossed over to the other side of the court.

All this time the Queen had never left off staring at the Hatter, who trembled so, that he shook both his shoes off.

"Give your evidence," the King repeated angrily, "or I'll have you executed, whether you're nervous or not."

"I'm a poor man, your Majesty," the Hatter began in a trembling voice, "and I hadn't but just begun my tea—not above a week or so—and what with the bread and butter getting so thin—and the twinkling of the tea——"

"The twinkling of *what?*" said the King.

"It *began* with the tea," the Hatter replied.

"Of course, twinkling begins with a T!" said the King sharply. "Do you take me for a dunce? Go on!"

"I'm a poor man," the Hatter went on, "and most things twinkled after that—only the March Hare said——"

"I didn't!" the March Hare interrupted in a great hurry.

"You did!" said the Hatter.

"I deny it!" said the March Hare.

"He denies it," said the King; "leave out that part."

"Well, at any rate, the Dormouse said——" the Hatter went on, looking anxiously round to see if he would deny it too; but the Dormouse denied nothing, being fast asleep.

"After that," continued the Hatter, "I cut some more bread and butter—"

"But what did the Dormouse say?" one of the jury asked.

"That I can't remember," said the Hatter.

"You *must* remember," remarked the King, "or I'll have you executed."

The miserable Hatter dropped his teacup and bread and butter, and went down on one knee. "I'm a poor man, your Majesty," he began.

"You're a *very* poor *speaker*," said the King.

Here one of the guinea-pigs cheered, and was immediately suppressed by the officers of the court. . . .

"If that's all you know about it, you may stand down," continued the King.

"I can't go no lower," said the Hatter; "I'm on the floor, as it is."

"Then you may *sit* down," the King replied.

Here the other guinea-pig cheered, and was suppressed.

"Come, that finishes the guinea-pigs!" thought Alice. "Now we shall get on better."

"I'd rather finish my tea," said the Hatter, with an anxious look at the Queen.

"You may go," said the King; and the Hatter hurriedly left the court, without even waiting to put on his shoes.

"——and just take his head off outside," the Queen added to one of the officers; but the Hatter was out of sight before the officer could get to the door.

"Call the next witness!" said the King. . . .

Alice watched the White Rabbit as he fumbled over the list, feeling very curious to see what the next witness would be like, "for they haven't got much evidence *yet*," she said to herself. Imagine her surprise when the White Rabbit read out, at the top of his shrill little voice, the name "Alice!"

"Here!" cried Alice, quite forgetting in the flurry of the moment how large she had grown in the last few minutes, and she jumped up in such a hurry that she tipped over the jury-box with the edge of her skirt, upsetting all the jurymen on to the heads of the crowd below, and there they lay sprawling about, reminding her very much of a globe of gold-fish she had accidentally upset the week before.

"Oh, I *beg* your pardon!" she exclaimed in a tone of great dismay, and began picking them up again as quickly as she could, for the accident of the gold-fish kept running in her head, and she had a vague sort of idea that they must be collected at once, and put back into the jury-box, or they would die.

"The trial cannot proceed," said the King, in a very grave voice, "until all the jurymen are back in their proper places—*all*," he repeated with great emphasis, looking hard at Alice as he said so.

Alice looked at the jury-box, and saw that, in her haste, she had put the Lizard in head downwards, and the poor little thing was waving its tail about in a melancholy way, being quite unable to move. She soon got it out again, and put it right; "not that it signifies much," she said to herself; "I should think it would be *quite* as much use in the trial one way up as the other."

As soon as the jury had a little recovered from the shock of being upset, and their slates and pencils had been found and handed back to them, they set to work very diligently to write out a history of the accident, all except the Lizard, who seemed too much overcome to do anything but sit with its mouth open, gazing up into the roof of the court.

The whole pack of cards came flying down upon her; she gave a little scream, and tried to beat them off. Then she found herself lying on the bank, with her head in the lap of her sister, who was gently brushing away some dead leaves that had fluttered down from the trees on her face.

"What do you know about this business?" the King said to Alice.

"Nothing," said Alice.

"Nothing *whatever?*" persisted the King.

"Nothing whatever," said Alice.

"That's very important," the King said, turning to the jury. They were just beginning to write this down on their slates, when the White Rabbit interrupted. "*Un*important, your Majesty means, of course," he said, in a very respectful tone, but frowning and making faces at him as he spoke.

"*Un*important, of course, I meant," the King hastily said, and went on to himself in an undertone, "important—unimportant — unimportant — important——" as if he were trying which word sounded best.

Some of the jury wrote it down "important," and some "unimportant." . . . At this moment the King, who had been for some time busily writing in his notebook, called out "Silence!" and read out from his book: "Rule Forty-two. *All persons more than a mile high to leave the court.*"

Everybody looked at Alice.

"*I'm* not a mile high," said Alice.

"You are," said the King. "Nearly two miles high," added the Queen.

"Well, I shan't go, at any rate,"

said Alice. "Besides, that's not a regular rule; you invented it just now."

"It's the oldest rule in the book," said the King.

"Then it ought to be Number One," said Alice.

The King turned pale, and shut his notebook hastily. "Consider your verdict," he said to the jury, in a low, trembling voice. . . . "No, no!" said the Queen. "Sentence first—verdict afterwards."

"Stuff and nonsense!" said Alice loudly. "The idea of having the sentence first!"

"Hold your tongue!" said the Queen, turning purple.

"I won't!" said Alice.

"Off with her head!" the Queen shouted at the top of her voice. Nobody moved.

"Who cares for you?" said Alice (she had grown to her full size by this time). "You're nothing but a pack of cards!"

At this the whole pack rose up into the air, and came flying down upon her; she gave a little scream, half of fright and half of anger, and tried to beat them off, and found herself lying on the bank, with her head in the lap of her sister, who was gently brushing away some dead leaves that had fluttered down from the trees on her face.

"Wake up, Alice dear!" said her sister. "Why, what a long sleep you've had!"

"Oh, I've had such a curious dream!" said Alice; and she told her sister, as well as she could remember them, all these strange adventures of hers that we have just been reading about; and when she had finished, her sister kissed her, and said: "It *was* a curious dream, dear, certainly. But now run in to your tea; it's getting late."

So Alice got up and ran off, thinking while she ran, as well she might, what a wonderful dream it had been.

THE FABLES OF ÆSOP THE SLAVE

THE OLD HOUND

A HOUND who had worked well in the hunt for many years at last became old and feeble. One day when hunting the stag he happened to be the first to come up to the animal, and seized him by the leg; but his old broken teeth were not able to hold tightly, and so the deer escaped. Upon this his master flew into a great rage and began to strike the dog with his stick. The poor old hound replied:

"Do not strike your old servant. I would gladly serve you still, but I have not the strength. If I am not of much use now, remember how useful I have been."

Never despise old people because they are feeble and perhaps not very sharp. Remember how much good work they did while they were able.

THE TOWN MOUSE AND THE COUNTRY MOUSE

THE country mouse one day received a visit from another mouse who lived in the town, and who had been his playfellow when quite young. He did his best to provide the town mouse with nice food, but it was quite clear that he did not care much about it. The town mouse presently said to him: "How can you put up with this nasty little hole in a farmyard where it is often cold and wet, when you might come to the town with me and live in a fine house and have all kinds of nice things to eat?"

He soon persuaded the country mouse, and the two set out that night to return to town, and safely arrived at the house where the town mouse lived. Here the country mouse found everything very comfortable. He sat on a rich carpet and ate scraps of all manner of nice things that had been served for supper. He was enjoying himself very much, when suddenly the noise of someone opening the door and the barking of two or three dogs that came running in nearly frightened the country mouse out of his wits, and he was only just able to escape in time.

When he recovered his breath, he exclaimed:

"If this is town life it will not do for me. I would rather have my poor quiet hole in the farmyard, where I can live in peace and safety."

We should not envy rich people, for they often have much more care and trouble than the poor.

THE NEXT STORIES ARE ON PAGE 3159

A FAMOUS POEM BY LORD BYRON

LORD BYRON'S famous poem tells the story of three brothers who were imprisoned in the ancient castle of Chillon, which still stands on the Lake of Geneva. They suffered in the cause of religion. Two of them died in the prison, and were buried beneath the floor of the dungeon in which they were immured. The third of the brothers, who tells the story as set forth in the poem, was set free at last, but having lost, by the death of his two brothers, all that he held dear, his freedom came too late to be enjoyed, and the poem ends with his saying: "Even I regained my freedom with a sigh." Only a portion of the famous poem is here given, but it contains some of the finest passages, and particularly that in which the poet makes the prisoner say that if the bird which visited him and sang to him in his loneliness had indeed been the spirit of his brother, it would not have heedlessly flown away after cheering him with its song.

THE PRISONER OF CHILLON

CONTINUED FROM 3030

O GOD! it is a fearful thing
To see the human soul take wing
In any shape, in any mood:
I've seen it rushing forth in blood,
I've seen it on the breaking ocean
Strive with a swol'n, convulsive motion,
I've seen the sick and ghastly bed
Of sin delirious with its dread;
But these were horrors—this was woe
Unmix'd with such—but sure and slow;
He faded, and so calm and meek,
So softly worn, so sweetly weak,
So tearless, yet so tender, kind,
And grieved for those he left behind;
With all the while a cheek whose bloom
Was a mockery of the tomb,
Whose tints as gently sunk away
As a departing rainbow's ray;
An eye of most transparent light,
That almost made the dungeon bright,
And not a word of murmur, not
A groan o'er his untimely lot—
A little talk of better days,
A little hope my own to raise,
For I was sunk in silence—lost
In this last loss, of all the most;
And then the sighs he would suppress
Of fainting Nature's feebleness,
More slowly drawn, grew less and less:
I listened, but I could not hear;
I call'd, for I was wild with fear;
I knew 'twas hopeless, but my dread
Would not be thus admonishéd;
I call'd, and thought I heard a sound—
I burst my chain with one strong bound,
And rushed to him—I found him not,
I only stirr'd in this black spot,
I only lived, I only drew
The accursed breath of dungeon-dew;
The last, the sole, the dearest link
Between me and the eternal brink,
Which bound me to my failing race,
Was broken in this fatal place.
One on the earth, and one beneath—
My brothers—both had ceased to breathe:
I took that hand which lay so still,
Alas! my own was full as chill;
I had not strength to stir, or strive,
But felt that I was still alive—
A frantic feeling when we know
That what we love shall ne'er be so.
I know not why
I could not die,
I had no earthly hope but faith,
And that forbade a selfish death.

What next befell me then and there
I know not well—I never knew—
First came the loss of light and air,
And then of darkness, too:
I had no thought, no feeling—none—
Among the stones I stood a stone,
And was scarce conscious what I wist,
As shrubless crags within the mist;
For all was blank, and bleak, and grey;
It was not night, it was not day;
It was not even the dungeon-light,
So hateful to my heavy sight,
But vacancy absorbing space,
And fixedness without a place;
There were no stars, no earth, no time,
No check, no change, no good, no crime,
But silence and a stirless breath
Which neither was of life nor death;
A sea of stagnant idleness,
Blind, boundless, mute, and motionless!

A light broke in upon my brain—
It was the carol of a bird;
It ceased, and then it came again,
The sweetest song ear ever heard,
And mine was thankful till my eyes
Ran over with the glad surprise,
And they that moment could not see
I was the mate of misery;
But then, by dull degrees, came back
My senses to their wonted track;
I saw the dungeon walls and floor
Close slowly round me as before,
I saw a glimmer of the sun
Creeping as it before had done,
But through the crevice where it came
That bird was perched, as fond and tame,
And tamer than upon the tree;
A lovely bird with azure wings,
And song that said a thousand things,
And seem'd to say them all to me!
I never saw its like before,
I ne'er shall see its likeness more;

It seem'd like me to want a mate,
But was not half so desolate,
And it was come to love me when
None lived to love me so again,
And cheering from my dungeon's brink,
Had brought me back to feel and think.
I know not if it late were free,
Or broke its cage to perch on mine ;
But knowing well captivity,
Sweet bird ! I could not wish for thine !
Or if it were, in winged guise,
A visitant from Paradise ;
For—Heaven forgive that thought ! the while
Which made me both to weep and smile—
I sometimes deem'd that it might be
My brother's soul come down to me ;
But then at last away it flew,
And then 'twas mortal well I knew,
For he would never thus have flown,
And left me twice so doubly lone,
Lone as the corse within its shroud,
Lone as a solitary cloud—
A single cloud on a sunny day,
While all the rest of heaven is clear,
A frown upon the atmosphere,
That hath no business to appear
When skies are blue, and earth is gay.

THE OLD CLOCK ON THE STAIRS

We have often seen in reading through the CHILD'S BOOK OF POETRY how the poets have contrived to express in the music of words something of the sound and movement of actual life. Here, in this famous poem by Henry W. Longfellow, the writer takes a very familiar subject, and yet we find that he invests an old clock with mysterious and almost dramatic interest. Every little effect of his verse is carefully correct, and the stately, sober, unceasing swing of the pendulum is rendered in a most impressive way in the solemn refrain " For ever—never ! Never—for ever !"

SOMEWHAT back from the village street
Stands the old-fashioned country seat.
Across its antique portico
Tall poplar-trees their shadows throw ;
And from its station in the hall
An ancient timepiece says to all :
" For ever—never !
Never—for ever ! "

* * * * *

By day its voice is low and light ;
But in the silent dead of night,
Distinct as a passing footstep's fall
It echoes along the vacant hall,
Along the ceiling, along the floor,
And seems to say at each chamber door :
" For ever—never !
Never—for ever ! "

Through days of sorrow and of mirth,
Through days of death and days of birth,
Through every swift vicissitude
Of changeful time, unchanged it has stood,
And as if, like God, it all things saw,
It calmly repeats those words of awe :
" For ever—never !
Never—for ever ! "

In that mansion used to be
Free-hearted Hospitality ;
His great fires up the chimney roared ;
The stranger feasted at his board ;
But, like the skeletons at the feast,
That warning timepiece never ceased :
" For ever—never !
Never—for ever ! "

There groups of merry children played,
There youths and maidens dreaming strayed ;
Oh, precious hours ! Oh, golden prime,
And affluence of love and time !
Even as a miser counts his gold,
Those hours the ancient timepiece told :
" For ever—never !
Never—for ever ! "

From that chamber, clothed in white,
The bride came forth on her wedding night ;
There, in that silent room below,
The dead lay in his shroud of snow ;
And in the hush that followed the prayer,
Was heard the old clock on the stair :
" For ever—never !
Never—for ever ! "

All are scattered now and fled,
Some are married some are dead ;
And when I ask, with throbs of pain,
" Ah, when shall they all meet again ? "
As in the days long since gone by,
The ancient timepiece makes reply :
" For ever—never !
Never—for ever ! "

Never here—for ever there,
Where all parting, pain, and care,
And death, and time shall disappear,
For ever there, but never here !
The horologe of Eternity
Sayeth this incessantly :
" For ever—never !
Never—for ever ! "

THE SPRING WALK

Thomas Miller, who wrote these simple verses descriptive of the pleasant sights and sounds that mark a country walk in the days of spring, was a very interesting character. Born at Gainsborough, in Lincolnshire, August 31, 1807, he was apprenticed to a basket-maker ; but having a real love of Nature and a desire to improve himself, he learned to read and write, and, some of his verses being seen by Rogers, the poet banker, he was encouraged to come to London, where he lived for years as a bookseller and author, dying in 1874. "The Sun," on page **1491**, is by the same poet.

WE had a pleasant walk to-day,
Over the meadows and far away,
Across the bridge by the water-mill,
By the woodside, and up the hill ;
And if you listen to what I say,
I'll tell you what we saw to-day.

Amid a hedge, where the first leaves
Were peeping from their sheaths so shy,
We saw four eggs within a nest,
And they were blue as the summer's sky.

An elder-branch dipp'd in the brook,
We wondered why it moved, and found
A silken-hair'd, smooth water-rat
Nibbling and swimming round and round.

Where daisies open'd to the sun,
In a broad meadow, green and white,
The lambs were racing eagerly—
We never saw a prettier sight.

We saw upon the shady banks
Long rows of golden flowers shine,
And first mistook for buttercups
The star-shaped yellow celandine.

Anemones and primroses,
And the blue violets of spring,
We found whilst listening by a hedge
To hear a merry ploughman sing.

And from the earth the plough turn'd up
There came a sweet refreshing smell,
Such as the lily of the vale
Sends forth from many a woodland dell.

We saw the yellow wallflower wave
Upon a mouldering castle wall,
And then we watched the busy rooks
Among the ancient elm-trees tall.

And leaning from the old stone bridge,
Below we saw our shadows lie,
And through the gloomy arches watch'd
The swift and fearless swallows fly.

We heard the speckle-breasted lark
As it sang somewhere out of sight,
And we tried to find it, but the sky
Was fill'd with clouds of dazzling light.

We saw young rabbits near the wood,
And heard a pheasant's wing go "whir;"
And then we saw a squirrel leap
From an old oak-tree to a fir.

We came back by the village fields,
A pleasant walk it was across 'em,
For all behind the houses lay
The orchards red and white with blossom.

Were I to tell you all we saw,
I'm sure that it would take me hours;
For the whole landscape was alive
With bees, and birds, and buds, and flowers.

THE FAITHFUL BIRD

In this poem William Cowper is very probably describing an incident from his own experience with his pet birds. There is not much in the story he has to tell, and yet how pleasant it is to read, and how gently it conveys a little lesson to us which should make us entertain the kindliest feelings for the "happy prisoners" of the cage.

THE greenhouse is my summer seat;
My shrubs, displaced from that retreat,
Enjoy'd the open air;
Two goldfinches whose sprightly song
Had been their mutual solace long
Lived happy prisoners there.

They sang as blithe as finches sing
That flutter loose on golden wing,
And frolic where they list;
Strangers to liberty, 'tis true,
But that delight they never knew,
And therefore never miss'd.

But Nature works in every breast
With force not easily suppress'd;
And Dick felt some desires,
That, after many an effort vain,
Instructed him at length to gain
A pass between the wires.

The open windows seem'd to invite
The freeman to a farewell flight;
But Tom was still confin'd;
And Dick, although his way was clear,
Was much too generous and sincere
To leave his friend behind.

So, settling on his cage, by play,
And chirp, and kiss, he seem'd to say,
You must not live alone—
Nor would he quit that chosen stand
Till I, with slow and cautious hand,
Return'd him to his own.

THE COUNCIL OF HORSES

John Gay, born at Barnstaple in 1685, and died in London, December 4, 1732, was a poet who had much success in his own day, and although his works, as a whole, are now but little read, many of his songs and shorter poems have enduring merit. While best known as the author of the "Beggar's Opera," his "Fables" are perhaps the most quoted of all his writings, and of these we have selected the following example, which is very familiar in style and "moral."

UPON a time a neighing steed,
Who graz'd among a numerous breed,
With mutiny had fired the train,
And spread dissension through the plain
On matters that concern'd the state,
The council met in grand debate.
A colt whose eyeballs flamed with ire,
Elate with strength and youthful fire,
In haste stept forth before the rest,
And thus the listening throng address'd:
"Goodness, how abject is our race,
Condemn'd to slavery and disgrace!
Shall we our servitude retain,
Because our sires have borne the chain?
Consider, friends, your strength and might;
'Tis conquest to assert your right.
How cumbrous is the gilded coach!
The pride of man is our reproach.
Were we design'd for daily toil,
To drag the ploughshare through the soil,
To sweat in harness through the road,
To groan beneath the carrier's load?
How feeble are the two-legg'd kind!
What force is in our nerves combin'd!
Shall, then, our nobler jaws submit
To foam and champ the galling bit?
Shall haughty man my back bestride?
Shall the sharp spur provoke my side?
Forbid it, heavens! Reject the rein;
Your shame, your infamy, disdain.
Let him the lion first control,
And still the tiger's famish'd growl.
Let us, like them, our freedom claim,
And make him tremble at our name."
A general nod approv'd the cause,
And all the circle neigh'd applause.
When, lo! with grave and solemn pace,
A steed advanc'd before the race,
With age and long experience wise;
Around he cast his thoughtful eyes,
And, to the murmurs of the train,
Thus spoke the Nestor of the plain:
"When I had health and strength like you,
The toils of servitude I knew;
Now grateful man rewards my pains,
And gives me all these wide domains.
At will I crop the year's increase;
My latter life is rest and peace.
I grant, to man we lend our pains,
And aid him to correct the plains;
But doth not he divide the care,
Through all the labours of the year?
How many thousand structures rise,
To fence us from inclement skies!
For us he bears the sultry day,
And stores up all our winter's hay.
He sows, he reaps the harvest's gain;
We share the toil and share the grain;
Since every creature was decreed
To aid each other's mutual need,
Appease your discontented mind,
And act the part by Heaven assign'd."
The tumult ceas'd, the colt submitted,
And, like his ancestors, was bitted.

THE WIND AND THE MOON

Dr. George Macdonald, to whose rich fancy we owe this charming poem, wrote many fine novels. We could almost guess from reading the following that he could write a pretty fairy tale, and he really did write many delightful stories of fairyland. He was a remarkable preacher, and altogether a man of very original mind. Born at Huntly, Aberdeenshire, in 1824, he died in Italy on September 18, 1905.

SAID the Wind to the Moon, "I will blow you out!
You stare
In the air
As if crying 'Beware!'
Always looking what I am about.
I hate to be watched! I will blow you out!"

The Wind blew hard, and out went the Moon.
So, deep
On a heap
Of clouds, to sleep
Down lay the Wind, and slumbered soon,
Muttering low, "I've done for that Moon!"

He turned in his bed: she was there again!
On high
In the sky,
With her one ghost-eye,
The Moon shone white and alive and plain.
Said the Wind, "I will blow you out again!"

The Wind blew hard, and the Moon grew slim.
"With my sledge
And my wedge
I have knocked off her edge!
I will blow," said the Wind, "right fierce and grim,
And the creature will soon be slimmer than slim!"

He blew and he blew, and she thinned to a thread.
"One puff
More's enough
To blow her to snuff!
One good puff more where the last was bred,
And glimmer, glimmer, glum will go that thread!"

He blew a great blast, and the thread was gone.
In the air
Nowhere
Was a moonbeam bare:
Larger and nearer the shy stars shone:
Sure and certain the Moon was gone!

The Wind he took to his revels once more;
On down
And in town,
A merry, mad clown,
He leaped and holloed with whistle and roar—
When there was a glimmering thread once more!

He flew in a rage—he danced and blew;
But in vain
Was the pain
Of his bursting brain,
For still the Moon-scrap the broader grew
The more that he swelled his big cheek and blew.

Slowly she grew—till she filled the night,
And shone
On her throne
In the sky alone,
A matchless, wonderful, silvery light,
Radiant and lovely, the queen of the night.

Said the Wind, "What a marvel of power am I!
With my breath,
In good faith,
I blew her to death!
First blew her away right out of the sky,
Then blew her in: what a strength am I!"

But the Moon she knew naught of the silly affair;
For high
In the sky,
With her one white eye,
Motionless miles above the air,
She never had heard the Wind blare.

THE BEST SCHOOL OF ALL

There is, of course, but one "best school," and that is the one at which each of us has been a scholar. Our own old school, no matter what others may think of theirs, is to us "the best school of all." Mr. Henry Newbolt, one of the finest living poets, in these ringing and vigorous verses celebrates with the true touch of boyish patriotism the memory of all our schooldays. One would be sorry for the "old boy" who could not sing this fine song and feel it to be true, for he would have missed one of the real pleasures of life. It is here reprinted by special permission of Mr. Newbolt.

IT's good to see the school we knew,
The land of youth and dream,
To greet again the rule we knew
Before we took the stream:
Though long we've missed the sight of her,
Our hearts may not forget;
We've lost the old delight of her,
We keep her honour yet.

We'll honour yet the school we knew,
The best school of all:
We'll honour yet the rule we knew,
Till the last bell call.
For, working days or holidays,
And glad or melancholy days,
They were great days and jolly days
At the best school of all.

The stars and sounding vanities
That half the crowd bewitch,
What are they but inanities
To him that treads the pitch?
And where's the wealth, I'm wondering,
Could buy the cheers that roll,
When the last charge goes thundering
Beneath the twilight goal?

The man that tanned the hide of us,
Our daily foes and friends,
They shall not lose their pride of us
Howe'er the journey ends.
Their voice, to us who sing of it,
No more its message bears,
But the round world shall ring of it
And all we are be theirs.

To speak of Fame a venture is,
There's little here can bide,
But we may face the centuries,
And dare the deepening tide:
For though the dust that's part of us
To dust again be gone,
Yet here shall beat the heart of us—
The school we handed on!

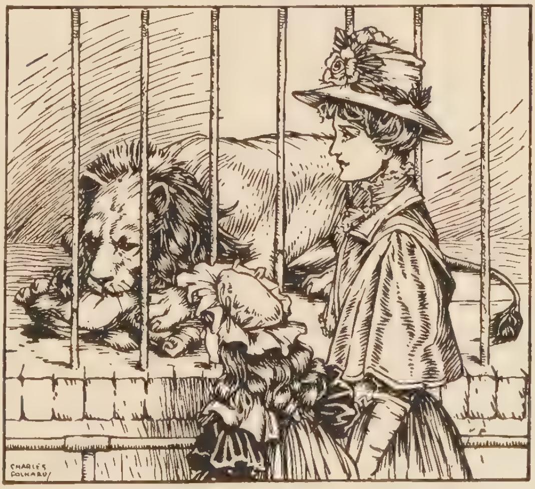
We'll honour yet the school we knew,
The best school of all:
We'll honour yet the rule we knew,
Till the last bell call.
For, working days or holidays,
And glad or melancholy days,
They were great days and jolly days
At the best school of all.

READING

THE DIFFERENT KINDS OF PRONOUNS

CONTINUED FROM 2896

We left off our last lesson at the point where the Pronouns HE, SHE, IT were invited out to tea, and, I am sorry to say, behaved rather rudely. But these are not the only Pronouns, so they need not get conceited.



Now, suppose mother takes you one afternoon to the ZOO to see the animals there; and suppose you are in the place where the LIONS are kept; and suppose it is just feeding-time, and you are watching one great lion eating his dinner; and suppose you turned to mother and said, "Oh, I say, mother, don't YOU think HE is a beauty?" What would you have been doing? You would have been using a sentence with three different Pronouns in it. When you are talking about yourself, you say I; when you are talking to your mother, you say YOU; and when you point to the lion and talk about him, you say HE. And these are three different persons: (1) yourself, (2) mother, (3) the lion. We will be very polite, and call the lion a person, so that if ever we meet him out in the street we can tell him that we always treated him with great respect, and then, perhaps, he will not hurt us.

Now, there is a different Pronoun for each of the three persons: I is the Pronoun used by the person speaking when he is speaking about himself; YOU is the Pronoun of the person spoken to; and HE is the Pronoun of the person spoken about. And these are called the First Person, the Second Person, and the Third Person. So we can draw up a little plan like this:

PRONOUNS

1st Person	2nd Person	3rd Person
I	YOU	HE

But we learned before, on page 1447, that there were two kinds of people and animals—males and females; so when we talk about a male person or animal we say HE, but when we talk about a female we say SHE. If you were telling me a story about a girl, you would not say HE, but SHE; and you would not begin a history lesson about King John by saying, "Now, as to King John, SHE was a very bad man." Everybody would laugh at you if you did, and no wonder. Once more, if you were talking about a thing instead of a person, you would say IT; you would say, "I don't like this pen; IT won't write." You would not say, "SHE won't write." So our plan can now grow a little bigger:

1st Person	2nd Person	3rd Person
I	YOU	HE, SHE, IT

But suppose there were two of you, you and your brother, and you had been to the circus; what would you say when father asked you, "Well, how did you both enjoy yourselves?"

You would not say, "I enjoyed it very much," for that would not mean both of you; so you would have to say, "WE enjoyed it very much." And if you were talking about two lions, or three men, or four tables, you would say THEY, wouldn't you? So our plan grows bigger still:

	Singular	Plural
1st Person	I	WE
2nd Person	YOU	YOU
3rd Person	HE, SHE, IT	THEY

We sometimes use THOU for the Singular of the Second Person, but not often, except in our prayers to God.

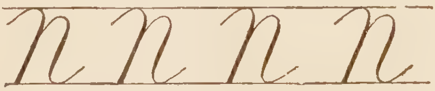
Here are some of the Pronouns in a funny rhyme:

I like my porridge very hot,
But YOU prefer yours cold;
HE is a baby in a cot,
But SHE is very old.
IT eats its breakfast on its head,
But THEY like theirs best in bed.

WRITING

CAPITAL M, N, S, L AND D

"WE are now going to see how to make N and M, your letter and mine, Nora; but these are capital letters," said her mother at the next writing lesson. "There are two ways of making them; we will learn the usual one first. There is N. What do you think of your letter, Nora?"



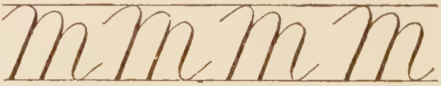
Nora noticed that the first pot-hook was twice the height of little n, but the second pot-hook ending in the pot-hanger was not so high as the first. Her mother said now Nora would be able to write her name quite the right way, beginning with a capital N.

"Perhaps M makes its capital in the same way. Does it, mother?" asked Tom.

"See if you can make one," was the reply.

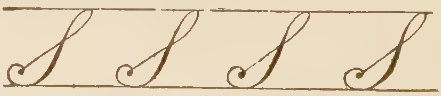
Tom took his pencil, looked at N, made a little m, and then wrote a small m very big, like n in three parts instead of two. He made the last two pot-hooks the same height as one another.

"Nearly right!" exclaimed his mother. "Now watch me write M, and see where yours is different."



Tom saw at once that all three of the pot-hooks were of different heights, none alike; and Nora said it reminded her of a staircase, and that it would be easy to distinguish her own letter from her mother's, because the M was grown up and bigger than N.

"Another time you shall learn the other capital N and M; but to-day capital S is waiting its turn. Here it is," said the mother, as she wrote it.

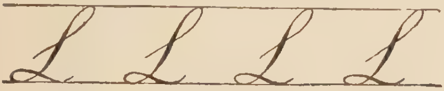


Nora and Tom looked at it, and noticed how very like a little s it was, really s with a big loop at the top.

"That loop," said their mother, "reminds us of the loop of string they tie on to parcels in the shops to help us carry them. S begins the word swing. That will remind us."

"Tom swings them on his forefinger, when he carries them for us," said Nora. "So you will remember capital S, Tom."

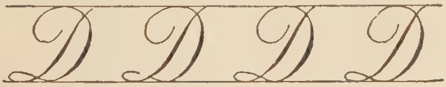
When the children had written S, they were shown another capital letter.



"Mother, I thought you were going to make S again," said Nora; "but you did not begin the long up-stroke quite so far down as with S."

"But the L ends quite differently," replied her mother. "Instead of the down-stroke turning round to the left and ending in a dot, it makes a loop, and the pencil comes down to touch the line again on the other side of the down-stroke, and turns up at the end; so, you see, L has two loops. I has one loop, but L has two loops."

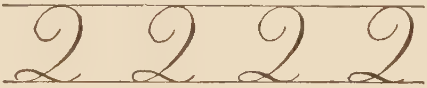
The next letter to be written was D.



"D needs care in making," the children were warned. "Other letters have parts like it. The down-stroke ends like the lower loop of L, and the pencil touches the line again on the other side of it; it then goes right up and round, passes the top of the down-stroke, makes a half-circle round to the left, and ends near the down-stroke. Look well at the letter before copying it."

Tom and Nora found D wanted more care to write nicely than any letter they had yet made, but they persevered till their D's were good and even, and then they were shown how to write the remaining capital letter, Q.

"Here is Q," said their mother, as she wrote it like this:



"It starts with a big curved down-stroke, reaching below the upper line, turns up and round to the right, and the down-stroke ends exactly like L's. It is only the upper part that is new to us, and the letter is very much like a giant 2, with a loop."

In our next lesson we shall learn something quite new—how to make figures.

ARITHMETIC

MULTIPLYING BIG NUMBERS TOGETHER

In our last lesson we saw how to find the value of ten times a given number. We have only to move each figure from its own place into the next place on the left. This leaves us with no figure for the unit's place, so that we must put a 0 into it. Thus, the number 34, when multiplied by 10, gave us 340.

Now, it is clear that if we take 10 times 34, and add to it another 10 times 34, we shall then have 20 times 34. In other words, to find 20 times a given number, we must not only move each figure from its own place to the next place on the left, but we must also double each figure.

```
 34
 20
---
680
```

Thus, to arrange our work on paper, we place the multiplier, 20, under the 34, so that the 0 comes one place to the right of the unit's place in the multiplicand (as we call the number to be multiplied). Then, since we have to double the 34, we say: Twice 4 are 8, twice 3 are 6. We have for the answer 68. As we have multiplied only by 2, and not by 2 *tens*, or 20, you see at once that the answer is ten times too small. To make it right, bring down the 0 to the unit's place, which moves each figure one place to the left, and therefore multiplies the number by ten, giving the correct answer 680.

Now that we understand *why* we do this, we may just as well write the 0 in the unit's place *first*, and then multiply the number by 2, setting down the figures of the result to left of the 0.

How much is 20 times 1728?

```
 1728
   20
-----
34560
```

As before, write the multiplier, 20, so that its 0 is below and to the right of the unit's figure of the 1728.

Then, first, put 0 into the unit's place; next, twice 8, 16, put down 6, carry 1; twice 2, 4, and 1, 5, put down 5; twice 7, 14, put down 4, carry 1; twice 1, 2, and 1, 3.

It is evident that we multiply by 30, 40, 50, and so on, in the same way. For example, to find 70 times 234, we have this:

$$\begin{array}{r} 234 \\ 70 \\ \hline 16380 \end{array}$$

Put 0 in the unit's place. Multiply 234 by 7.

This leads us to the multiplication by 100. If we followed the same rule, we should first have 0 in the unit's place, and then 10 times the number on the left of this 0. But to get 10 times the number we simply have to write a 0 after it. Thus, our answer consists of the given number *with the two* 0's *after it.*

So, to multiply a number by 100, write 00 after it.

Another way of seeing the same thing is this. Take the number 34 as an example. We want each figure to be 100 times its present value. Therefore, 4 units become 4 hundreds, and 3 tens become 3 thousands; so we must have a 3 in the thousand's place, a 4 in the hundred's place, and fill in the tens and units with 0's.

We now come to the method of multiplying by any other number consisting of two figures.

Suppose we have to find the value of 43 times 126.

It is quite evident that if we first write 126 *three* times, and add, and then write it *forty* times and add, we shall, by adding these two results together, obtain forty-three times 126. That is what we actually do, the work being arranged in the following way:

$$\begin{array}{rrrrl} & 1 & 2 & 6 & \\ & & 4 & 3 & \\ \hline & 3 & 7 & 8 & = \text{3 times 126} \\ 5 & 0 & 4 & & = \text{40 times 126} \\ \hline 5 & 4 & 1 & 8 & = \text{43 times 126} \end{array}$$

Write the multiplier, 43, with its unit's figure, 3, under the unit's figure, 6, of 126. First, multiplying 126 by 3, we get 378. Then, multiplying 126 by 40, we get 504 *tens.* Placing them in columns as we have learned to do, and adding them, we have 5418, which is 43 times 126.

Let us look carefully at one or two things in working this problem. When we multiply by 3, we say, 3 times 6 units equal 18 units—that is, 1 ten and 8 *units.* We put the 8 into the unit's place and carry the 1 ten. Three times 2 tens are 6, plus 1 ten carried are 7 tens, the 7 to be in the ten's place. Three times 1 hundred are 3 hundred, the 3 to be in the hundred's place.

Next, we must multiply 126 by 4, which makes 504; but, as we have really multiplied by 4 *tens,* each figure must be moved one place to the left, so that 4 will be in the ten's place, under the 7, the 0 in the hundred's place, under the 3, and the 5 in the thousand's place. You can see that an 0 is understood in the unit's place, but is not necessary, as the position of the figures in columns has already given each its value.

Notice, also, that in both lines of our multiplication we *write the first figure of our result under the figure by which we are multiplying.* The work is done as follows:

$$\begin{array}{rrrr} & 1 & 2 & 6 \\ & & 4 & 3 \\ \hline & 3 & 7 & 8 \\ 5 & 0 & 4 & \\ \hline 5 & 4 & 1 & 8 \end{array}$$

4 sixes, 24; put down 4 *under the* 4 *by which we multiply,* carry 2. 4 twos 8, and 2, 10; put down 0, carry 1. 4 ones, 4, and 1, 5. Next, 3 sixes, 18; put down 8 *under the* 3 *by which we multiplied,* carry 1. 3 twos, 6, and 1, 7. 3 ones, 3. Add 378 and 504(0) = 5418.

This method may be used in multiplying by numbers of any size, unless one 0, or more, occurs in the multiplier. Let us see what can be done in such a case. Multiply 126 by 403.

$$\begin{array}{rrrrr} & & 1 & 2 & 6 \\ & & 4 & 0 & 3 \\ \hline & & 3 & 7 & 8 \\ 5 & 0 & 4 & & \\ \hline 5 & 0 & 7 & 7 & 8 \end{array}$$

Multiplying by 3 units we have 378. There are *no tens* by which to multiply, so we must leave that for the present. Next, multiply 126 by 4, as we have learned to do, and we have 504. As we have really multiplied by 4 hundreds (400), each figure must be moved 2 places to the left, as there are 2 zeros in 400, and as the 4 *must* be put under the 4 of the multiplier. Adding the results, we have the answer 50778.

If you will compare this answer with that obtained when we multiplied 126 by 43, you will see that, although we could not multiply by 0, we really had to keep a place for it in the ten's column, and so we may as well put it there.

ANSWERS TO EXAMPLES ON PAGE 2892.

1. 1524 plants. 2. 2056 lines.

3. 418 pennies.

4. Sixty-four thousand eight hundred and eighty-one. 5. 1701 marbles.

THE BEAUTIFUL LAND OF SOUND

We have had such happy times with our little fairies, and have been so pleased with the kind goblins, that I am sure we are quite ready to go a little farther, and find out how we can make their beautiful secrets our own.

We must learn to know all the different ways of touching the notes, and many other things besides. We must know what to do when we want to hear soft, singing voices. If we would hear the wings of the wind—for fairies and goblins love the great storm spirit—we must learn the secret of quite a different way of approaching the notes. When an artist paints a picture, he does not try to manage with one brush; he has need of many. There are the large, bold effects which need big brushes; there are the dainty little details requiring the lightest treatment, such as no big brush could ever give.

THE BEAUTIFUL LAND OF SOUND BEHIND THE STONE WALL

So it is with our magic kingdom, the piano; if only we take the trouble to find the right brushes the secrets will come to us, and, when we play, those who listen will lose themselves in the beauty of the story which the fairies have taught us.

Once upon a time there was a very great man, who knew the wonderful language of the music fairies so well that his name will never die. He wrote deep, glorious music, which one day you and I will enjoy. His name was Beethoven, and if we want to understand and to learn from him, we must know what it is to listen to the songs in the trees, to hear the fairy music in the rippling stream, and to see the wee folk flying by in the fleeting white clouds. The great Beethoven loved country rambles; he was always happy when he was with dear Mother Nature, and she taught him songs. The fairies are keeping these wonderful songs for us—songs that will never die.

Many of these beautiful themes came to him while he sat under a tree, and he scribbled them down then and there, so that his wonder dreams should be shared by all the children of earth. He has given us stories of lightning and thunder; sometimes his music shows us the story of the sunset, or he takes us into the quiet, and we feel he is telling us of peaceful summer skies. Yes, he has left us every sort of song that mortal ear can hear, and if we want to conjure up these stories for ourselves, if we want the piano fairies to help us, we have much to learn.

There are many little exercises which will do great things for us, if we learn them carefully; and if we begin to wonder why such funny things are necessary, we must remember how many beautiful stories are waiting for us, if only we have the patience to learn how to discover all they have to say.

Quite the best, and yet the most difficult thing of all, is to play a simple melody. The piano must really *sing*. Through all the interesting work we are going to do together, that one idea must be our king of thoughts—*the piano must sing*. We must listen very carefully to each tone to be quite sure that we are treating all the fairies equally well. We have a king of thoughts, and now we have found the queen, and as we want to remember both of them, we must say them over again to ourselves.

We must learn how to make the piano sing. We must never touch a note without listening to it.

Why are we talking like this before doing one single exercise? Well, this wonderful world of music is an enchanted land, and its many gates can be opened even by us, although it is possible for them to remain fast locked. It all depends on whether we know the right keys.

We shall have to think very much about our fingers, a great deal about our hand, and our arm will need much thought, too; but all that is only the means to the end. We are like travellers in a new country, and we come to a high stone wall. Some people think only of the stones, but we have heard that there is a glorious treasure inside, and we are eager to find it as quickly as possible. See, between the stones there is a chink, which shows a glimpse of the light within. So, while we work away at the stones—that is, while we do our exercises with all our will and best endeavour—let us never forget that the object of our working is to get through the chink into the treasure-house where so much beauty is waiting for us.

DRAWING

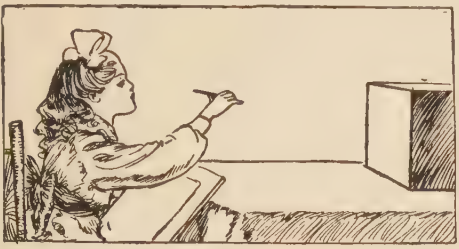
MEASURING THINGS FROM A DISTANCE

The box we drew some time ago was placed in front of us—just opposite, and below the eye. Let us see if we can draw it in another position—a little to the left, and still below the eye. When we drew the flat sheet of paper, and learned how to draw the book, we found that the side-lines slanted away from us towards the point immediately opposite us, and as far away as we could see when we looked straight in front of us.

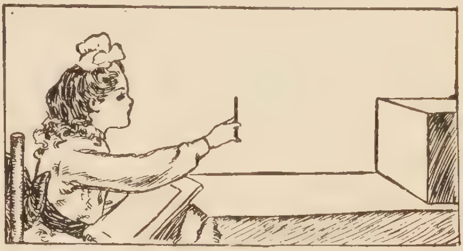
We can understand a little better about these lines if we look at a straight road leading away from us, or at straight railway lines. The road seems to get narrower in the distance, and the railway lines to run closer together. Standing at one end of a room, and looking at the opposite end, we see the floor lines slanting up, and the ceiling lines down towards our own eye-level. Tall men and women see more than short ones, or than little children, and people standing on heights see more than those on the level ground.

So we see that our drawings must be of objects as *we* see them ourselves. The sketches of the boxes on this page will help us to draw some from our own view, but nobody else's drawing will show quite the same view as ours; so we must make our own drawing, and not copy other people's.

Shall we put our box a little on the right-hand side, so that we see the top and one side? We will draw it in black and white chalk on brown paper, beginning with the side nearest to us. If the box is square, the side will not look quite square, for shapes alter if they are moved sideways from the eye, as they do, too, when moved nearer or further in an opposite direction. But we must be careful not to exaggerate this alteration of shape; and to prevent our doing this, there is a way of measuring lines at a distance which is very useful. It is always rather difficult to learn new ways; but after a little practice we shall find that this one is quite worth the trouble.



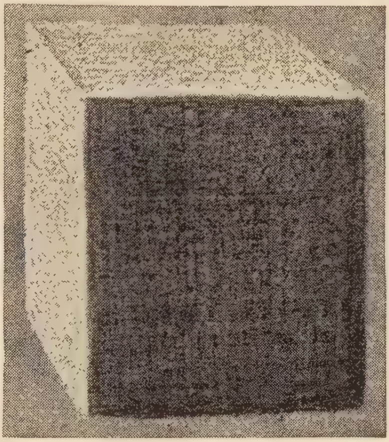
How to hold the pencil for the top line



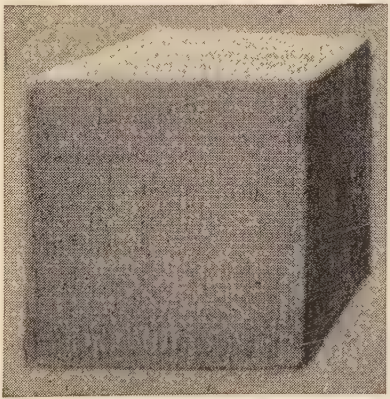
How to hold the pencil for the side line

We shall want a long pencil—or a ruler even. We must sit quite straight, and hold the pencil at arm's length, and keep one eye tightly shut. The pencil must be held in a horizontal position, one end hiding one top corner of the box from our view. With the forefinger of the other hand we mark where the other corner is, on the pencil. Let us rest a little now, taking care not to lose the measurement we have made on the pencil—we can hold it at that place with the right hand till we are ready to shut one eye again.

Now, still keeping the fingers of the right hand on the first measurement, and holding the pencil upright at arm's length against one of the edges of the front side of the box, we can find out if the top or the side edge seems longer, by seeing if the part we measured in the horizontal position of the pencil is bigger or smaller than the part we measured when we held it upright. This way of measuring seems rather tiresome at first, but all artists find they must use it to get the proportion of things—that is, how wide or how narrow anything is in proportion to its height, or how big one thing is in proportion to another. We shall be able by-and-by to get the proper proportion of big things at a distance, like ships or buildings. People who cannot use this sort of measurement sometimes draw cows as big as churches, and men and women as big as the houses in the same picture.



The right-hand view of a box



Here is a left-hand view of another box

One thing we have to remember, though, is that we do not measure the actual size of anything in this way—only the *proportion* of one part to another. We choose for ourselves how big to draw the things according to the size we want our picture to be.

Now we will try to draw the box, using all the things we have learned to help us. Lines furthest from the eye slant most, so the lowest lines slant up the most. Those further to the right or left slant more than those nearer. The top of the box would look narrower than the bottom if we could see both, because it is higher, and therefore nearer the eye-level. In putting in shading we must not show the chalk outline, because we do not see it in the real box. The outlines of objects have no black lines round them. They are shown by difference of light and shade.

LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English words. Third line: As we say it in English.

Il est dix heures et demie. Quelqu'un frappe à la porte. La bonne l'ouvre.
It is ten hours and half. Someone knocks at the door. The maid it opens.
It is half-past ten o'clock. Someone knocks at the door. The maid opens it.

C'est le facteur. Il a apporté un télégramme à Papa. Papa le lit vite.
This is the postman. He has brought a telegram to Papa. Papa it reads quickly.
It is the postman. He has brought Papa a telegram. Papa reads it quickly.

Papa dit qu'il doit aller à Londres pour affaire pendant quelque temps.
Papa says that he must to go to London for business during some time.
Papa says that he must go to London on business for a little while.

Maman et la bonne cherchent un portemanteau. Elles le remplissent d'habits.
Mamma and the nurse look for a portmanteau. They it fill with clothes.
Mamma and Nurse look for a portmanteau. They fill it with clothes.

Elles ferment le portemanteau et elles tournent la clef. Papa entre.
They shut the portmanteau and they turn the key. Papa enters.
They shut the portmanteau and turn the key. Papa comes in.

Il veut mettre un livre dans le portemanteau pour le lire en route.
He wishes to put a book into the portmanteau for it to read in route.
He wants to put a book in his portmanteau to read on the way.

" Où est la clef ? " demande Papa. Nous ne pouvons pas la trouver.
" Where is the key ? " demands Papa. We (not) are able not it to find.
" Where is the key ? " asks Papa. We cannot find it.

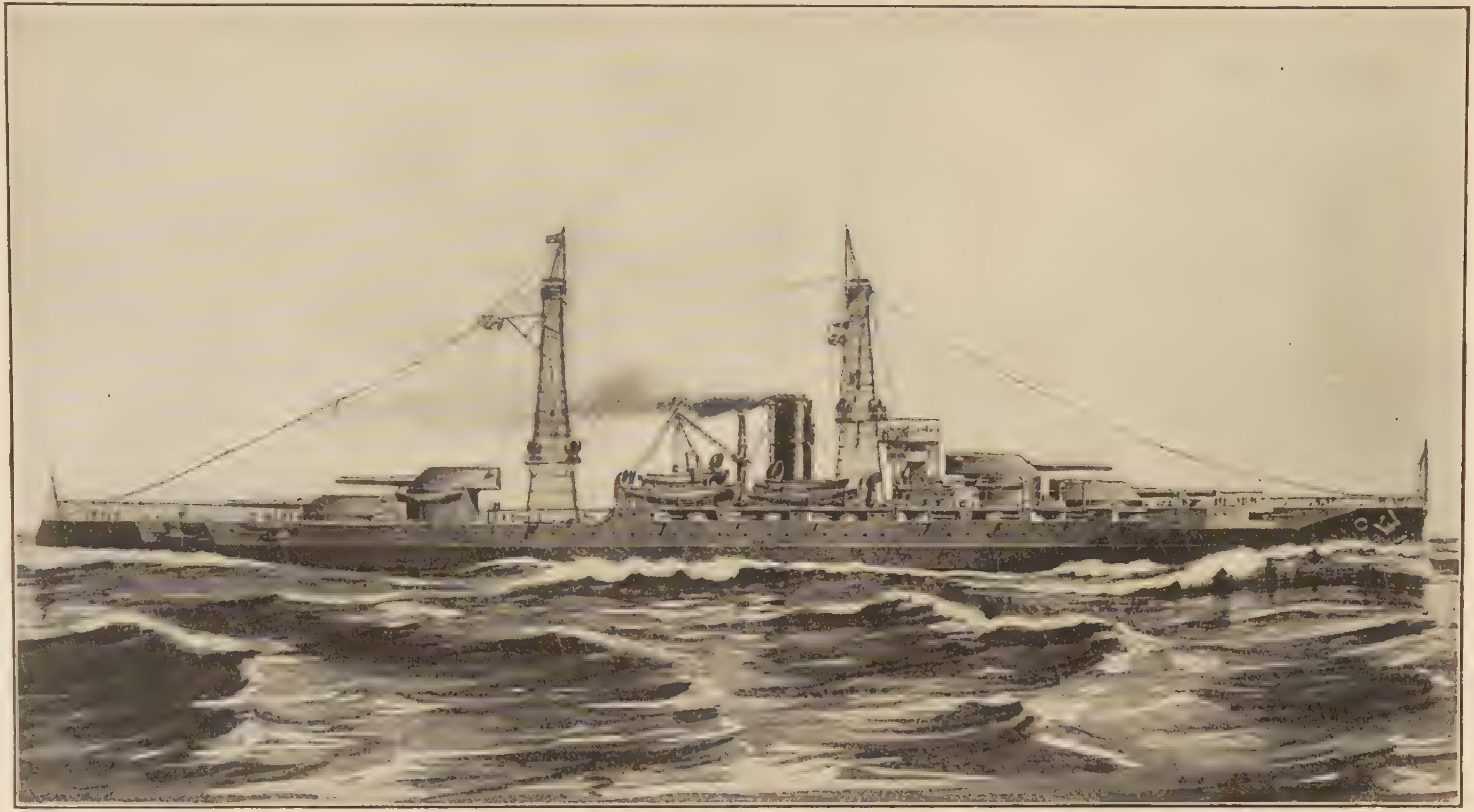
Il faut qu'il arrive à temps pour le train, et il se fait tard.
It is necessary that he arrives at time for the train, and it itself makes late.
He must be in time for the train, and it is getting late.

Nous cherchons sur la table, sur le plancher, et sous le sofa. Elle est perdue.
We search on the table, on the floor, and under the sofa. It is lost.
We search on the table, on the floor, and under the sofa. It is lost.

Puis la bonne crie : " La méchante ! " La clef est dans la bouche de Bébé !
Then the nurse cries : " The naughty one ! " The key is in the mouth of Baby !
Then Nurse cries : " Naughty child ! " The key is in Baby's mouth !

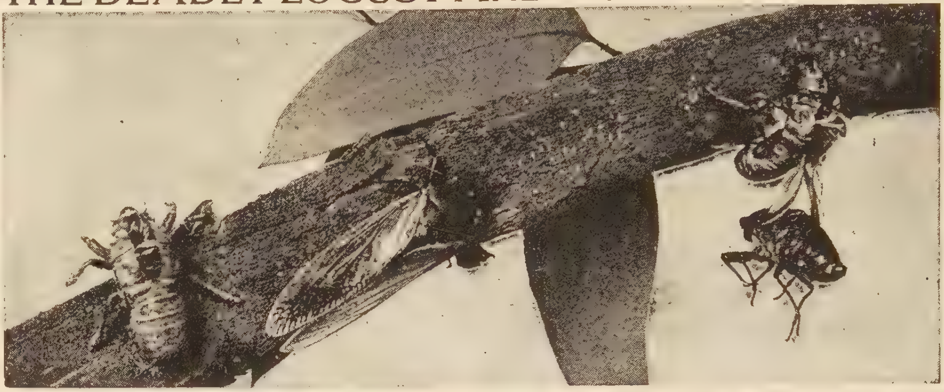
THE NEXT LESSONS ARE ON PAGE 3287

THE LARGEST BATTLESHIP AFLOAT



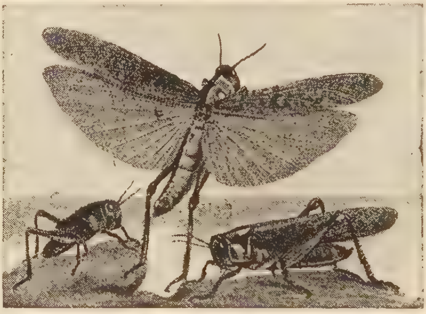
The giant super-dreadnought, "Pennsylvania," the latest addition to the United States Navy, is the largest battleship afloat. Her length is 608 feet, and she displaces 31,400 tons of water. Her main battery has twelve 14-inch guns, mounted in 5 turrets, with a secondary battery of twenty-two 5-inch guns, in addition to four submerged torpedo tubes. Her crew comprises a thousand officers and men. The "Mississippi," which is now being built, has the same dimensions and her main battery will be of the same size; but her secondary battery will have twenty-five 5-inch guns. She will displace 32,000 tons of water.

THE DEADLY LOCUST AND HOW MEN FIGHT IT



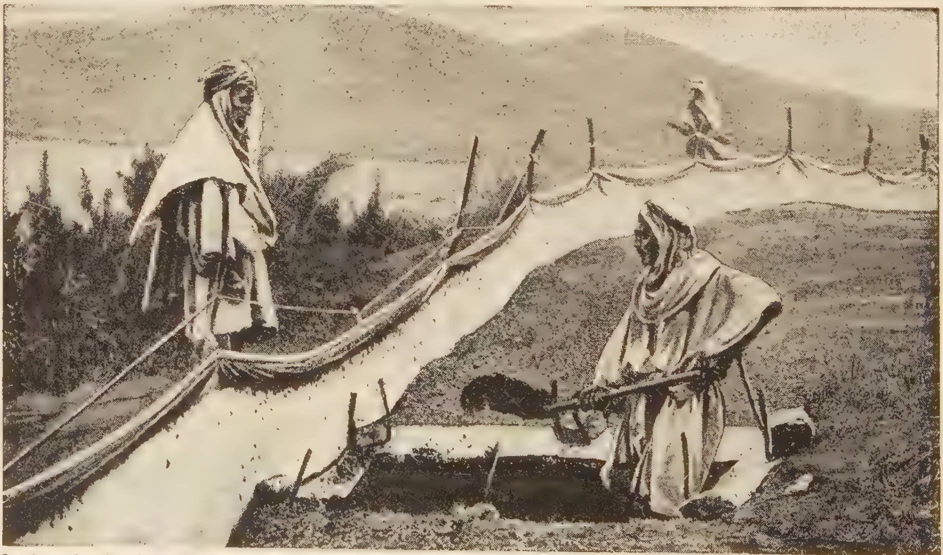
This picture shows the Australian cicada, a near relative of the deadly "seventeen-year" locust of America. All these insects go through the same four stages as butterflies. First there is the egg, then the larva, then the chrysalis, and finally the fully developed winged creature. Here we see, on the left, a cicada with the chrysalis shell it has just left, and on the right another cicada leaving the shell, with only the tips of its wings attached.

There are ten different kinds of grasshoppers in Britain. The one shown here is found in the late summer.



Here are three views of the migratory locust of South-East Europe. On the left is the larva, on the right the fully developed locust, and in the middle the same creature in flight.

Here we see the common house cricket, which makes its chirping noise by rubbing its wing-sheaths together.



In those lands where the locust swarms, and works such ruin, the most elaborate and costly means have to be taken to destroy them. Locusts cannot climb up a smooth surface, and so while they are wingless, and thus unable to fly, smooth canvas screens are set up across the line of march of a swarm, and, at intervals, pits are dug at the foot of the screen. The locusts, unable to surmount the screen, fall into the pits, where they are killed.

A locust storm in South Africa, such as this, stretches hundreds of miles, and blots out the light for hours.

SOME INSECT FOES OF MAN

CONTINUED FROM 2993

COLORADO BEETLE

Few of us imagine how important a part in the history of the world little insects play. Next to the poisonous snakes, they are really more to be dreaded than any other form of animal life. There is nothing else living that does so much damage to property. A lion or a tiger is more terrible to face than a mosquito, but the innocent-looking mosquito may cause death as surely as the fearful man-eater. Animals are big and comparatively few; insects are little, but their numbers are by no means small, they are more than men can count, and the insects are not discovered until the damage is done.

How a plague of insects begins it is not always easy to say. But we know how one began, and we may get an idea from that as to what happens in other parts. Up to about forty years ago the gipsy moth was unknown in Massachusetts. But then an unfortunate thing happened. A French scientist was carrying on experiments in his laboratory with the window open, when a gust of wind carried out into the garden a few eggs of the gipsy moth, that had been sent to him at his home in Massachusetts by a friend.

Those few eggs were hatched and the caterpillars became moths which laid many more eggs. So terribly did they increase that within a few years the gipsy moths had spread over an area of 220 miles. Men tried in vain to fight against the plague. The caterpillars swarmed over the trees and ate them bare, as if a fire had swept over the land. Over 40,000,000 trees were raided again and again in this way. The Government of the state spent as much as $90,000 a year for thirty years in succession, but still the plague continues, and still Massachusetts is robbed of much wealth by this pest.

The Colorado beetle is another dreaded enemy of the farmer. It is rather a handsome little beetle, with its orange-coloured, black-spotted coat, but it completely ruins the potato crop wherever it gets a hold. Until recent times it existed only on wild crops, but then it got among the cultivated potatoes of Colorado. The mother beetle lays hundreds of eggs on the leaves of the potato plant. The young ones hatch very quickly and lay eggs in turn, and the young ones from these then lay eggs—all this in one summer. During the winter they go to sleep in the ground, but wake up in the spring, and attack the plants so that in some parts the potato crops are completely destroyed. Any person found with living specimens in his possession is heavily fined. This pest is dreaded in Great Britain.

We all know the cuckoo-spit, or froth-fly, or frog-hopper, or froth-hopper, or frog-spit—it has all these names in different parts of the country. It is the insect which lives on stems of grass and many other growths. There are many varieties of it. It sucks the juice of the plant or growth upon which it lives, and forms a dwelling of froth, supposed by many people to be little bubbles blown by the cuckoo. If we remove the froth we find a surprising little animal inside, a yellowish-green insect with long hind legs, with which it can hop like a frog. A little girl discovered one of these insects by making the sun shine through a magnifying glass upon the froth. Out pounced the froth-fly, looking as surprised and angry as an insect can look.

Now, the frog-hopper serves to introduce us to one of his most dangerous relatives, the cicada, which, though known in Europe, is most deadly in America, where we name it the "seventeen-year" locust. This title is given it because it appears as a pest once every seventeen years. What happens is this: The male flies of the perfect cicada die soon after their wedding day; but the female fly lays about 500 eggs in the twigs of the tree upon which it settles, and then dies. But before it dies it inflicts terrible damage upon the tree. The eggs lie in the warmth and hatch, and the grubs, as soon as they are born, fall to the ground, and make their way into the soil. There they live for seventeen years, sucking the sap from the roots of plants, and doing great damage.

HOW MILLIONS OF DOLLARS ARE LOST THROUGH THE WORK OF A LITTLE FLY

At the end of their seventeen years underground they appear as flies, and then attack the foliage of the tree, completely ruining the fruit crop. Of course, some flies of this family appear every year, but it is only once every seventeen years that the multitudes come forth to work havoc. In 1874 the attack of these flies caused damage in four states in America amounting to $100,000,000, not to mention enormous damage through losses in trade dependent upon the crops which these insects had spoilt.

There is another cicada known as the thirteen-year locust, so called because it appears in swarms every thirteenth year. The cicada is a curiosity because of its loud and musical chirping. Some people, when there is not a plague of cicadas, keep the insects in cages for the sake of their chirping, which, when the air is still, can be heard a mile away. Whenever we think of damage done by insects, however, our thoughts always turn to the locust. That was the first destructive insect any of us read about, for its terrible ravages are described in the Bible. Well, the locust appears in just as great swarms to-day, and is every bit as much to be feared as it used to be in the old days.

FLYING ARMIES OF LOCUSTS THAT SOUND LIKE A RUSHING, MIGHTY RIVER

There are many species of locust, and its family includes our grasshoppers. Some locusts are only a quarter of an inch long; others are five inches in length. The female has a strong boring weapon, and with it she drills a hole in the ground, and there lays her eggs. When the young ones are hatched and grow strong, they have hearty appetites. At first they have no wings. So they march in countless armies, in search of food.

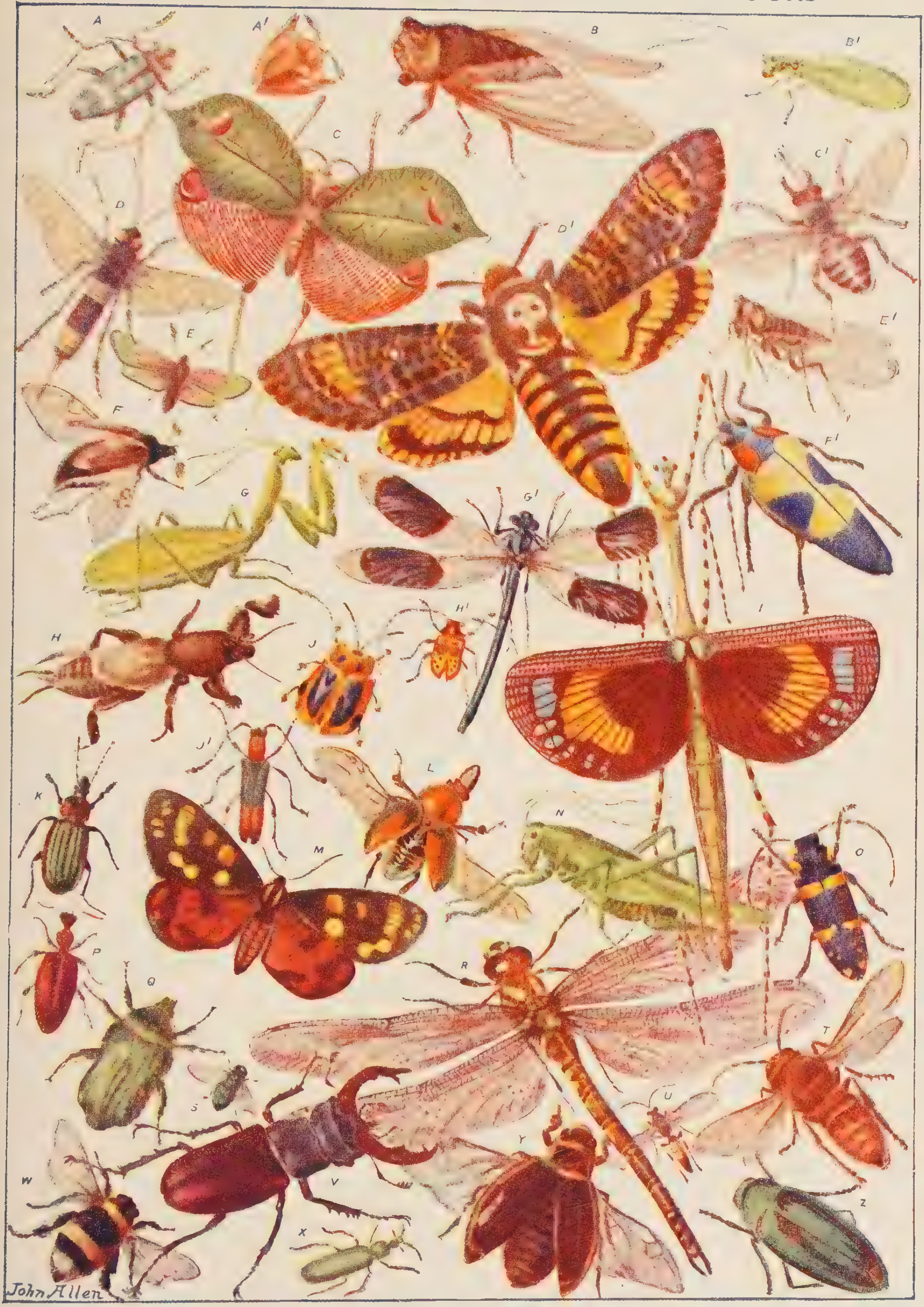
They go straight forward, nothing turning them aside. Every green blade disappears as they go. If they are not stopped, they feed and feed, and presently their wings appear, and then they rise into the air and continue their progress by flying. Then it is that travellers see them in the vast hordes of which they tell us. The swarms blot out the light of the sun. They fill the heavens as with a black cloud, and the noise of their wings and the movements of their hungry jaws is compared to the rushing sound of a broad river. They alight from time to time, and suddenly, where a few minutes before there appeared a field of corn or a grove of trees, there remains nothing but a mass of stubble, or a forest of bare branches.

On and on they go, travelling to lands beyond the sea. They have been met in a cloud 500 feet high, 1,200 miles from land. Wherever they have passed over land they have left ruin and desolation.

A SOLID BANK OF LOCUSTS FIFTY MILES LONG ON THE SEA-SHORE

Sometimes a great wind will blow them into the sea. This happened towards the close of the eighteenth century, in South Africa, where 2,000 square miles of land had been covered by them. A great wind blew them into the sea, and so many were drowned that when their bodies were cast up by the waves they formed a bank four feet high and fifty miles in length. Nothing can save the farmer over whose fields or orchards a swarm of

SOME INSECTS IN THEIR NATURAL COLOURS



In no department of animal life do we find such myriad forms as in the insect world. It is estimated that there are over a million different kinds of insects, more than all other varieties of living creatures together. On this page we see a few insects, some of which have no English names.

A. Arm-cheeked beetle
A1. Perforated tortoise beetle
B. Plant bug
B1. Lace-wing fly
C. Eyed leaf-insect
C1. Tsetse fly
D. Giant wood wasp
D1. Death's-head moth
E. Irish burnet moth
E1. Lantern fly
F. Cockchafer
F1. Chrysochroa
G. Praying mantis
G1. Demoiselle dragon-fly
H. Mole cricket
H1. Yellow longhorn beetle
I. Winged stick insect
J. Chinese tortoise beetle
J1. Australian longhorn beetle
K. Carabus ulens
L. Golden lamprinis
M. Scarlet tiger moth
N. Great green grasshopper
O. Countess beetle
P. Walking anthicus
Q. Rose-chafer
R. Great dragon fly
S. Greenbottle fly
T. Hornet
U Ichneumon fly
V. Stag beetle
W. Humble bee
X. Cerocoma schaefferi
Y. Great water beetle
Z. Serricornia sternicornis

The word insect means "cut into," and the name is given to these creatures because their body is so distinctly divided into three parts— the head, chest, and abdomen. Insects have wonderful organs of sight and smell. The cockchafer, for example, has 39,000 separate organs of scent.

locusts flies. The only hope seems to be to grapple with them before they get their wings—when they are marching on foot. Until 1881 they used to scourge the island of Cyprus. Then two clever men went into the problem, and mastered the locusts. It was a wonderful thing that they did—wonderful because, though it was successful, it was so simple. It was solely the result of watching the ways of the locusts.

THOUSANDS OF MILLIONS OF LOCUSTS CAUGHT IN ONE YEAR ON ONE ISLAND

The young locusts always march in a straight line. What the men did, therefore, was to erect great screens of canvas, and at the top they put smooth oilcloth. Now, the locusts cannot climb over anything smooth. So here were the great screens of canvas with oilcloth at the top ready for them.

When the locusts appeared, they began to climb up the canvas, but on reaching the oilcloth they fell back off it, crawled along at the foot of the screen until they tumbled into deep pits, which had been dug every few yards at the side of the screens. The pits were lined with polished zinc, so that, once in, the locusts could not get out, even if the weight of thousands and thousands of others falling on top had not prevented them. The men used 500,000 yards of canvas and dug 26,000 pits, and the result was that in the first year they caught 214,000,000,000 locusts, and in the following year 56,000,000,000 locusts. It cost $135,000 to do the work, but as each two shillings spent meant a million locusts destroyed, they thought the money was well used. And so it was, for locusts have now vanished from Cyprus. But supposing that these measures had not been taken, there would soon have been enough locusts in Cyprus alone to destroy the crops of any country to which the descendants of these swarms had flown.

THE LITTLE CRICKET THAT BURROWS UNDERGROUND & RUINS OUR GARDENS

The nearest approach to locusts that we get in this country are the grasshoppers and crickets. But we must be sure to remember that we need find no fault with our grasshoppers and field crickets. As a rule, they do us no harm. There is one dangerous member of the family, the mole cricket. This one has great claws in front, by means of which he bores a shaft, and from the bottom of it digs tunnels in all directions, like the mole. As he works straight through the roots that lie in his way, he may do a good deal of damage to the garden. The rest are harmless in the fields. Indeed, it is a question whether they are not of benefit to us, as they eat so many caterpillars and other harmful insects.

There is a striking difference between the grasshopper and the locust. The locust has its ears under its stomach, while the ears of the grasshopper are placed at the sides of its two front legs. The locust makes its loud chirp by rubbing its rough spiny wings one against another ; so do the grasshoppers and crickets. Only the males do this, however, for the females have no means of making this noise. The noise that these male insects make is their way of calling their mates to them, and the female gives the best reply by going herself to answer it. The house cricket cannot be regarded as a friend of man. It is a burglar which gets into our houses, tunnels its way into the side of the fireplace, and comes out at night to steal.

THE HOUSE CRICKET THAT LEAPS AND FLIES, AND GNAWS DAMP CLOTHES

Like the grasshoppers, crickets are great leapers. With their powerful jaws they can do a good deal of damage. They will gnaw holes in damp clothes placed before the fire to dry at nights. This they do for the sake of the moisture in the garments. One cricket jumped right into a cup of tea which was being drunk by a lady to whom the writer of this story was talking. Crickets can fly as well as jump, but as they only come out at night, and are anxious to get back to their holes the minute a light is turned on, we do not often see them flying.

It is evident to most of us that crickets and grasshoppers and locusts belong to the same order, but who would think that cockroaches are of the same family ? They are, and so are earwigs, though these are a division by themselves. The cockroach is that big, fat, nasty insect which many of us call the black-beetle. It is not a beetle, but is a member of the winged order called Orthoptera. It has, like the cricket, two pairs of wings, the outer ones of a horny character, and acting rather as a shield for the others than for the purpose of flight. The under pair, however, are excellent wings, though the cockroach runs so fast with his six splendid legs that he rarely has need to fly. The cockroach came to us in ships carrying cargo from the hot lands of Asia, and is comparatively a new resident with us. It is one of the most hateful things we have. It crawls all over any food that it can reach, and there issues from its mouth so foul a fluid that it spoils everything it touches. It is a confirmed cannibal.

THE STRONG JAWS OF THE EARWIG THAT BITE AND SPOIL OUR FLOWERS

In America it is matched by the earwig. Some naturalists say that the earwig will not readily eat the flesh of its kind, but that is not the case. If an earwig be killed at night where many earwigs assemble, in a few minutes the dead body will be surrounded by half a dozen other earwigs, all eating away as if there were nothing else in the world for them. The earwig does not come so much into our houses as the cockroach does; it is usually to be found among our flowers. Dahlias are its special favourites, though nasturtiums will always attract it. Its sharp jaws enable it to bite pieces out of our finest blooms, while the insect may generally be looked for in any pear or apple which a bird or wasp has attacked.

The mother cockroach lays her eggs in the most beautiful little horny case, sixteen eggs to the case; but after that she cares no more, and leaves the little ones entirely to themselves. The mother earwig is a really affectionate parent, and "mothers" her little ones like a hen or an old lady lobster. We must all have noticed how quickly an earwig drops to the ground if it is alarmed, or if it wishes to get quickly to the floor from the ceiling on which it is resting.

THE EARWIG'S BEAUTIFUL WINGS THAT WE VERY RARELY SEE

There is no reason why it should fall, except that it knows that its horny covering makes it safe to do so. It has the most beautiful wings folded away under the wing-covers on its back. It is quite a big task to get them unfolded and then folded back again in their proper position. There are thousands of earwigs in the ivy covering an English house known to this writer; but though swarms of earwigs, which come in through the open windows on summer nights, attracted by the light, have been examined, only one was seen to unfold its wings. The wings are not shaped like those of the cricket and grasshopper, but are more fan-shaped. The pincers, or forceps, which the earwig carries help it to fold up the wings again. But those forceps can nip too. One may have handled many earwigs without result, until it seems as if the stories as to their nipping were not true; but one day an earwig got on the present writer's forehead, and without any provocation gave him a nip which he will not soon forget.

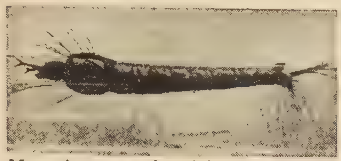
As we have read on another page, the story about earwigs getting into our ears is all nonsense; and that brings us to another absurd fable which terrifies very many people. Men and women who are otherwise well educated are so foolish as to believe if they hear a certain ticking in the woodwork of their houses, or their furniture, that it is a warning meant to tell them that a death is about to occur in their houses. An instant's serious thought should show how impossible the thing is; but as they cannot see what causes the sound they hear, and as people have for ages and ages believed the same thing, people go on believing the story to-day.

THE STRANGE TICKING SOUND OF A LITTLE BROWN BEETLE

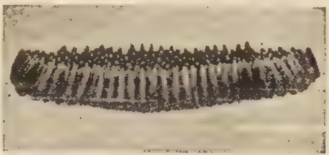
What is this fearful "death-tick" or "death-watch"? It is a sound made by a little wood-boring insect with a stupidly long name—the Xestobium tessellatum. It is simply a rather fat red-brown beetle which bores its way into the woodwork of our furniture, tunnels through and through it, eating the wood which it bores, and ruining the furniture just as fast as it can. It has a thick, horny head, and the so-called death-tick is the result of the beetle's calling to its mate, as the cricket calls to his.

But instead of rubbing legs or wings, the beetle bangs his silly little head on the wooden floor of his tunnel, and that is the way he signals to his sweetheart. Generally he knocks four or five times, then is still. Men have kept these insects at various times, and tried to make them utter their signal in the open, but without success, until one man chanced to knock gently with a pencil near the box in which the beetle was. Instantly the beetle thumped away with his head. And if we capture one of them and gently tap four or

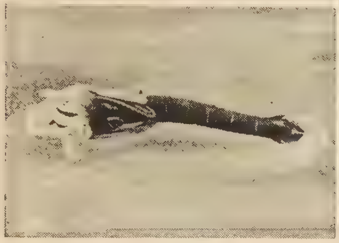
THE MOSQUITO, THE GNAT, AND THE MIDGE



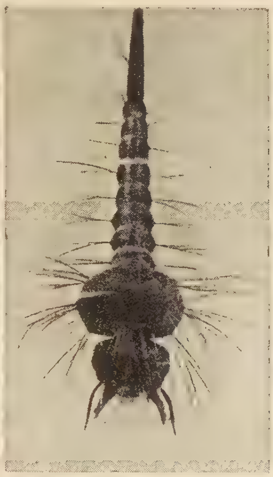
Mosquitoes are found from the Arctic Circle to the Equator. Here we see the larva of the spotted mosquito, which floats on water, but dives when alarmed.



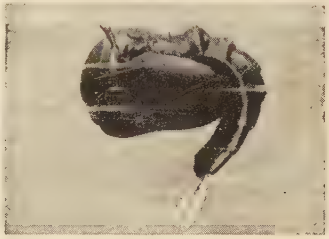
This curious object is a mass of eggs of the common grey gnat. There are as many as 375 eggs, and they float together on the water like a raft.



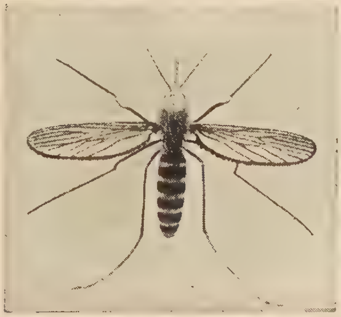
The chrysalis of our common grey gnat, shown here, first lives in the ground, but later swims on the water, where the skin splits and the gnat at once emerges.



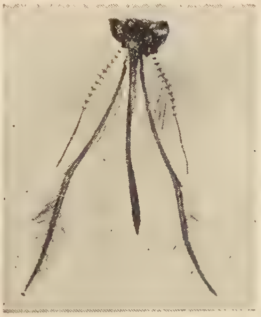
The larva of the common grey gnat usually rests at the surface of the water, but if alarmed it goes suddenly under.



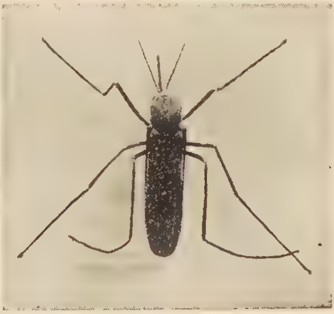
The chrysalis of the spotted mosquito rests on water, but can swim rapidly by jerking its abdomen, which is provided with two paddle-like organs.



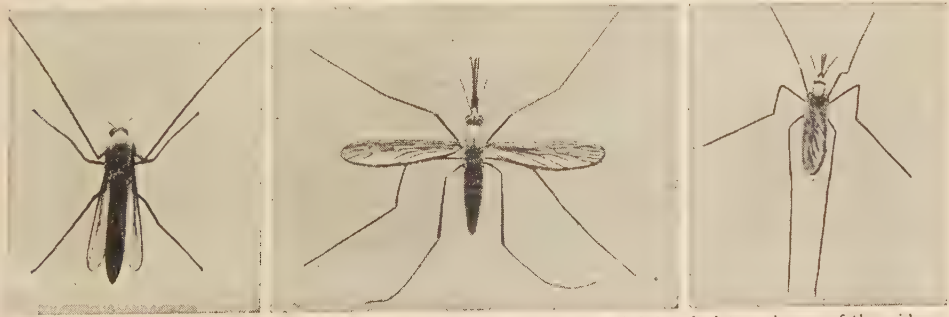
The female of the common grey gnat.



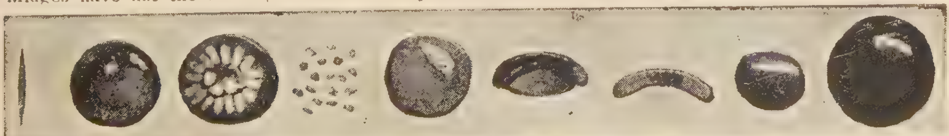
Magnified head of a mosquito.



The grey gnat as it appears when at rest.



The grey gnat is a mosquito, but the common black gnat, shown in the left-hand picture, is one of the midges. Midges have not the large proboscis of mosquitoes. The other pictures show female spotted mosquitoes.



The dreaded malaria is caused by a germ which certain mosquitoes introduce into man's blood by a bite. These pictures tell the life-story of the germ, which is magnified 5,000 times. First we see the original germ and then the same germ in the blood. Next it divides up into spores, or seeds, which become loose, as in picture 4, and grow crescent-shaped, as in the next picture. So far they are harmless, but if the mosquito bites a man the germs return to the insect and change, as in the last three pictures. If reintroduced into human blood, they cause malaria.

five times so that the beetle may hear, we can have as many "death-warnings" as we like, whenever the beetle is not asleep or too busy feeding.

The beetle that we have been discussing now is one of a family of insects which make their way into woodwork. They are as great a nuisance on land as the wood-boring worms are in the water. All the holes that we see in what we call worm-eaten wood are caused by these little pests and their young ones.

THE COMMON FLY THAT SPOILS THE MILK AND SPREADS DISEASE INDOORS

We need not leave the house to discover one of the greatest of pests, the fly. The only thing that can be said in favour of flies is that they are good scavengers out of doors, eating up all sorts of horrible refuse which would otherwise make the atmosphere foul. But in civilised countries we ought not to have to depend upon methods of scavenging such as prevail among savages. Flies carry disease to our food. When they are most abundant, in the latter part of the summer, they poison milk and other food which little children take, and cause many, many deaths. Indeed, the wise men of one big town in the North of England, where there are many poor people, came to this conclusion—that it would be cheaper for the town council to provide, at their own cost, pure milk which flies had not corrupted, than to bear the cost of all the funerals of little pauper children whose deaths had been caused by dirty habits of the flies.

Nothing is too bad for a fly to eat. It settles upon poisonous refuse, then flies off with parts of the poison adhering to it into a house, and there settles down on foodstuffs, on sugar, into milk, and so forth, and leaves corruption wherever it goes. The eggs of the common house-fly are laid in unhealthy refuse, where the grubs hatch and feed.

LITTLE FLIES THAT ARE OLD AND BIG FLIES THAT ARE YOUNG

Then they pass into a chrysalis stage, and eventually issue as perfect, full-grown flies. When we see flies of different sizes, we must not imagine that one is a young fly and another an old one They are all fully grown when they leave the chrysalis. We have two or three sorts in our houses. One of them, the one which we fancy bites, and does really bite, bites us to suck our blood. It is called the stomoxys, and is a small black fly, that does not appear until the autumn. The flies which we see hanging swollen and dead about the house have been killed by a fungus which attaches to them. This fungus eats its way into the body of the fly and kills it, and then spores drift off to become attached to other flies.

The bluebottle, which we almost forgive for its bright coat and breezy hum, is a filthy enemy of the larder. It deposits its eggs upon flesh, or in wounds of animals, and there the eggs hatch and the larvæ feed where they are.

We cannot stay to examine all the flies, for they are vastly numerous. We must, however, not overlook the dreaded tsetse fly. This, though it may bite man, does not cause him any serious harm, but its bite is certain death to horses, oxen, and dogs. It lives in certain districts in Africa, and is supposed not to stray beyond them. It is noticed, however, that if anything occurs to disturb the wild animals and to send them afield beyond the places which they ordinarily inhabit, there the tsetse fly is also discovered. It has been suggested that all wild animals near human habitations should be killed so that the dreaded fly may be destroyed.

BRAVE MEN WHO HAVE DIED TO SAVE US FROM PLAGUES CARRIED BY FLIES

As might be expected, there are innumerable varieties of flies in lands where we have heat and moisture prevailing in forest and swamp. South America and many parts of Africa are rendered almost unbearable by flies that sting and bite, while large areas in Italy—to name only one part of Europe—are the seat of disease and death every summer, as the result of winged plagues in undrained lands.

There is still much to be learned about poisonous insects, and many men are bravely devoting themselves to the work. Many men have sacrificed their lives while studying the problems. They have gone into lands infested with deadly insects, and allowed themselves to be bitten so that they might trace the manner in which the disease begins, the insects from which it comes, and the manner of dealing with it. The story of these men is very sad but very wonderful. They are as brave as the bravest soldier that ever fought on a battlefield, for they fight, not to kill men, but to save them, and they lay down their own lives to save those of millions of people who may never hear of them or of the sacrifice they make. Naturally, where there is so much to be learned, the way to knowledge is hard and difficult to discover.

THE DOCTOR WHO LIVED IN A SWAMP TO STUDY A FLY

One of the worst diseases which afflict men who go to the unhealthy parts of Africa is called sleeping sickness. When bitten by the insect which carries the particular sort of poison causing this disease, men become overpowered with a desire to sleep ; all their energy and will-power go from them, and they die. A great doctor named Professor Koch has been studying the problem. For eighteen months he lived by himself in the swampy regions round Lake Victoria Nyanza, in Africa, where poisonous insects teem in countless swarms. He believes that the disease is caused by the bite of an insect named the Glossina palpalis. This insect, he finds, breeds along the banks of the lakes and streams. It can be found from the source of a stream right down its banks running through hundreds of miles of country, spreading this terrible disease wherever it goes.

His experiments led him to a curious theory. He found that wherever there are crocodiles there also we find the insect which causes sleeping sickness. The insects, he says, live upon the crocodile in the first instance. They would seem to have a poor chance of biting these horny monsters. But they suck the blood between the armour plates of the crocodile's hide. When a man draws near they fly off to him to suck his blood, and in so doing they inject poison into his system which in the end causes his death.

A MOSQUITO PLAGUE THAT WOULD EMPTY NEW YORK IN A YEAR

Professor Koch says that we ought to kill all the crocodiles, so that, their chief food being destroyed, the deadly insects must to a great extent die out.

One of the deadliest foes of man in tropical lands is the mosquito. We often hear people say that we have no mosquitoes in this country, only gnats and midges. But such people are entirely wrong in so saying. We have many mosquitoes here, and they are in some years so numerous as to make it almost impossible for men to work in the fields. Their bite causes death even here, though, happily, that rarely happens. But in India men, women, and children used to die from a terrible illness which we call malaria, at the rate of 5,000,000 a year. Deaths at that rate in New York would leave not a soul alive in that capital in little more than a year. There were places in Africa where the death-rate from malarial fever was so terrible that these places were called "the white man's grave." All sorts of beliefs as to the cause of these plagues were entertained. Many people thought that they resulted from poisonous fumes arising from the ground. But brave men like those of whom we have been reading risked their lives to solve the problem, and they found out what it all means.

They knew that death resulted when a man had been bitten by mosquitoes, but they could not for a long time discover which was the deadly mosquito that actually caused the tragedy.

AN INSECT THAT RIDES ON THE MOSQUITO AND CARRIES DEATH TO MEN

Among the men who studied the question in India was a brave young officer named Major Ronald Ross. He studied all the different varieties of mosquitoes that he could discover. He took samples of the blood of men who had been bitten, and found in them a tiny organism which evidently conveyed the poison that caused death. But how did the organism get into men's blood ? What had that to do with mosquitoes ?

After months and months of study he found that all the while he had been on the wrong track. The mosquito that he was seeking slept while he was awake, and came out to work its mischief while he was in bed. It is a night-flying mosquito. As soon as he discovered this, and examined the mosquito, he was rewarded for all his labours in examining other mosquitoes, for here was one different from the rest. Upon its body he noticed a little parasite. A parasite is, as we know, a small animal living upon the body of larger animals. This parasite was the origin of the poison. Like the ichneumon fly, it lays its eggs in the body of the mosquito. These lodge in the poison gland of the mosquito. When the mosquito bites a man, these eggs are forced into the wound caused by the bite, and there they develop and poison the man and cause his death.

It would be of little use to find the cause of death unless we were able also to find a remedy. Now, the life-history of mosquitoes, gnats, and midges is very similar. The full-grown insects lay their eggs either in water, or in damp, decaying vegetation, or behind the bark of fallen trees. There they hatch and come forth as full-grown insects, ready to carry on the work of destruction.

Now, in many countries, there is very little attempt at proper drainage. Stagnant pools lie about in the streets; rubbish collects in the villages; dirty old tins and cans lie about with water in them; water-butts are uncovered; there are a thousand places in which the deadly insects can be reared. Therefore, it became evident that if men, women, and children were to save their lives from the attacks of the insects, they must be clean in their habits.

DEADLY INSECTS THAT COMPEL US TO OBEY THE LAWS OF HEALTH

They must allow no pools of water to collect in their streets; they must allow no swamps to remain undrained near their cities; they must have no water-tanks open, or if they were open, then petroleum must be poured into the water to kill the insects there.

These horrid little insects, for whose existence it seemed impossible to find any excuse, might seem to have been sent by Nature to teach men to be clean. Towns which had been hot-beds of disease became absolutely healthy when the new rules were enforced. Death had been frightfully prevalent among the men who are building the Panama Canal, because of the bites of mosquitoes. The American Government sent skilful, determined men to carry out the work of making men clean and careful.

The stagnant pools were dried up; all rubbish was burnt; no place was left in which the mosquitoes could lay their eggs. And the result was that yellow fever and malaria, which the mosquitoes had previously caused, all disappeared. The same thing can be done for the health of people in the deadliest climates. If they will only attend to the laws of health, they need not fall victims; if they neglect them, then they fall victims to the insects which carry certain death. The same law applies to horrible parasites which afflict human beings at home.

HOW NATURE USES TINY INSECTS TO PUNISH CARELESS FOLK

Many unpleasant things, which we need not discuss, live upon the bodies of human beings if human beings are not careful. There is a parasite for everything. Animals have theirs, poultry and birds have theirs, and man has his. Man, with his superior sense, can avoid them if he will. All that he has to do is to keep himself perfectly clean, and he will escape, or, if he is temporarily attacked, then he must take the proper course to rid himself at once, and all will be well. If he will but keep himself clean, he can keep himself free; if he does not, then he must pay the penalty. Nature has no mercy for the careless and unclean.

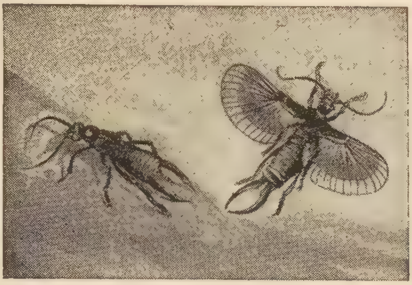
Our mosquitoes and midges in the Northern States are not very deadly. We have several species of mosquitoes, of which some bite. A gnat is a mosquito and a mosquito is, of course, a gnat. Those that have feathery, plume-like antennæ are harmless. These are the males, which live upon vegetable substances. Those that have not the plume, but sit, when at rest, with the hind legs upturned, are the females, and the ones that bite.

It is the female midge, too, which bites, not the male. Midges are smaller than the gnat, and, when examined under the microscope, are really beautiful little things to look at. But they are better dead than alive, for their bite is most painful. Like the mosquito and other blood-sucking insects, they have the most wonderful tools for their work.

THE LITTLE MIDGE WITH A LANCE FOR CUTTING AND A PUMP FOR SUCKING

They have barbed lances for cutting and sawing, and little pumps with which to suck up the blood. How it is that they cause such pain is not quite clear. Some men think that they squirt into the wound that they cause a little drop of poison to make the blood thinner and more ready to flow. The fact is, however, that, except in a year of many midges, we think so little of them that we do not bother to examine their ways. They affect people very differently.

The common cockroach of our kitchens comes from the Far East. It has wings, is distinct from the black-beetle, and is, in fact, not a beetle at all.



In the whole insect world there is no creature that has such large and gauzy wings folded into so small a space as the earwig. Here we see the large earwig with its wings closed up, and on the right the common earwig with wings extended.

The common bluebottle, or blowfly, has an amazing keenness of sense, probably of smell, which enables it to discover flesh at great distances.

Upon some they make merely a red spot; upon others they raise huge lumps, so big that, if the bite be upon the face, the whole eye may be closed up until the effects of the bite disappear.

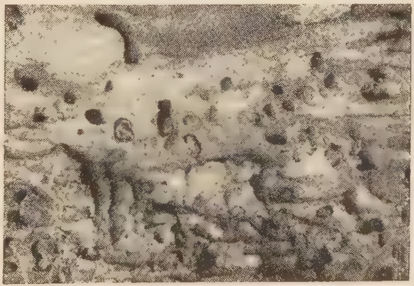
We ought to feel very thankful that the horse-flies do not often attack us. They are the great grey-bodied wretches which hum so loudly as they fly. They do not often bite men, but when they do they show the most alarming intelligence. They settle upon the back or shoulders, so that they may bite and not be immediately perceived, and so powerful are their tools that they can pierce thick clothing, and so reach the flesh beneath. Horses they attack by settling where the animals will be least likely to reach them with their tails.

There are other enemies of men which do not fly, and one of the commonest is the harvest mite. It is a little villain like a tiny copy of the red spider, whose attacks upon greenhouse growths the gardeners so much dread. This horrid insect reaches full growth in harvest time, and as we make our way through the fields, climbs upon us and crawls about our bodies until it can make its way into the flesh. It is almost impossible to see a harvest mite at the best of times, but once it has had a few minutes' start, to find it is impossible, for it tunnels into our flesh, and though it causes the most irritating smarting, we cannot reach it except by practically digging it out. The best thing to do is to rub the spot with ammonia.

The list of insect enemies is far from exhausted. There is a terrible array of them in the garden. We cannot deal with those here, but we must leave them for a story devoted entirely to the garden, with some pictures of the creatures actually at work. Those that we have been thinking of now, however, suffice to show us how very careful men have to be to guard their health and property from the lesser animals of the world. It is because they multiply with such terrible speed that the harmful insects do us so much damage. In the story that begins on page 3255, we see how the friendly insects help man to check the ravages of these insect enemies.

The next story of Nature is on page 3255.

The dreaded tsetse fly of Africa is little larger than our house-fly, and, although harmless to men and wild beasts, its bite is fatal to all domestic animals.

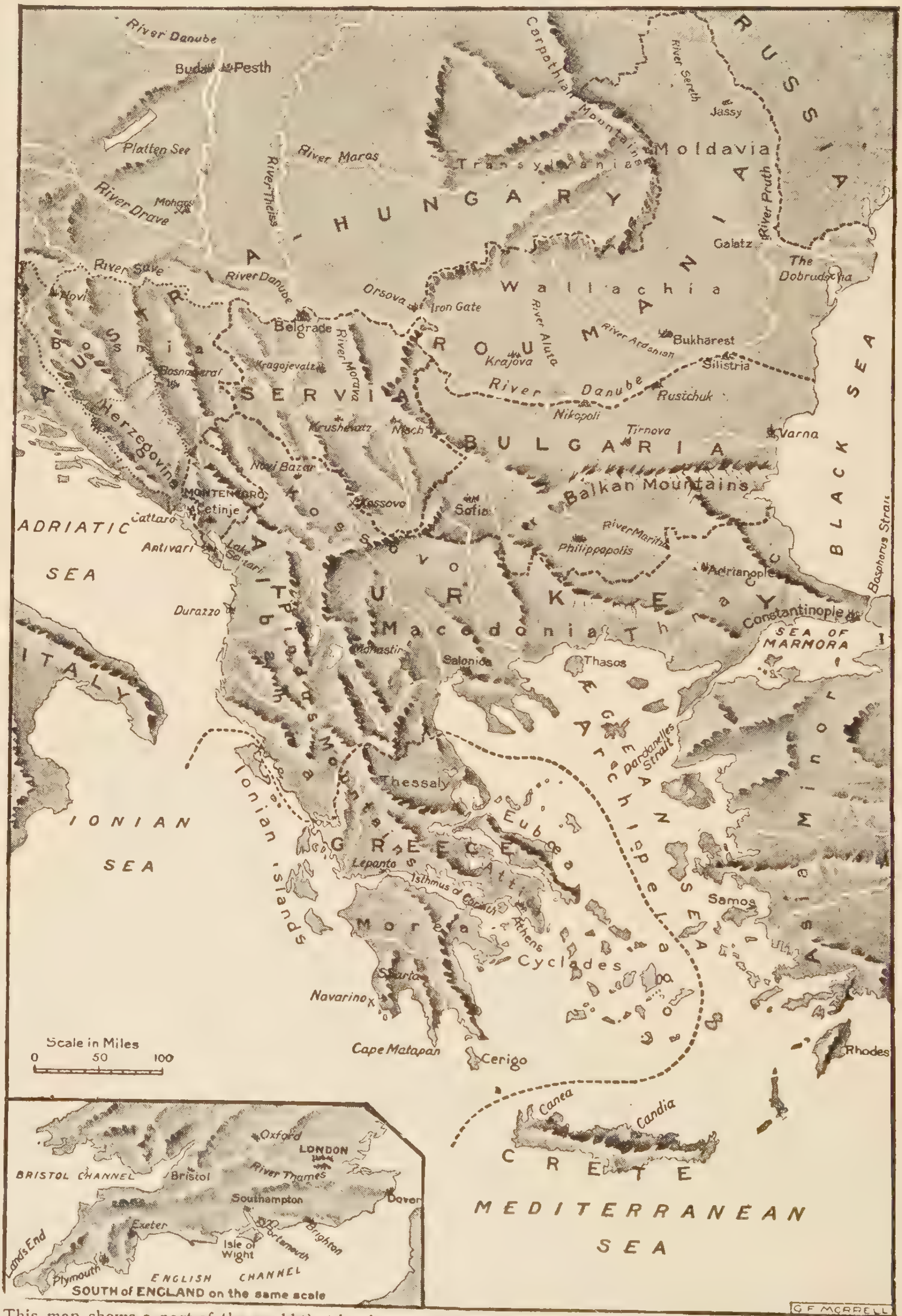


The death-watch is a beetle that seldom shows itself, but its curious ticking sound is feared by the superstitious, and it works havoc in our furniture and the floors and beams of our houses by riddling the wood with the tiny holes which it bores.

The great horse-fly sucks the blood of our horses and cattle, and in India even the elephant's thick skin does not protect him from the horse-fly.

The photographs on these pages are by Gordon W. Pepper, Frank P. Smith, Percy Collins, and others.

TURKEY AND THE BALKAN STATES



This map shows a part of the world that has been well described as "the cockpit of Europe," for right down the ages it has been, like the pits where game-cocks used to fight their battles, a constant scene of dispute and warfare. The map represents the boundaries before the revolt against Turkey in 1912, by which the territory of that power was much reduced. The victors have not yet agreed upon a division of the conquered territory.

The top picture on page 3151 is by E. Armitage, R.A., and hangs in the Walker Art Gallery, Liverpool, and the picture of the Empress Theodora on page 3153 is by Val Prinsep, R.A., and is reproduced here by permission of Mrs. Sholto Vere Hare, the owner.

No more magnificent site was ever selected for a city than that upon which Constantinople stands. Here we are looking from the city across the Golden Horn, the crescent-shaped arm of the Bosphorus

THE BALKAN PENINSULA

THE RISE AND DECLINE OF TURKEY

CONTINUED FROM 3024

MOHAMMED II

The Balkan Peninsula is washed by four seas. There is the Adriatic, the Archipelago, the sea of many islands, the Sea of Marmora, and the Black Sea. Two narrow straits, called the Dardanelles and the Bosphorus, connect the Sea of Marmora with the Sea of Many Islands and the Black Sea.

Most of this long coast-line, like that of Italy, is very beautiful; so are the "many islands" that surround it. We find the same deliciously warm, sunny climate, the same lovely bays with white or yellow sands, the same green hills or bare rocks running down to the intensely blue sea, the same exquisite veil of shining haze, fit robe for a country whose early legends and history are the most mysteriously beautiful and wonderful in the world.

But in the Balkan Peninsula we have no story, as we had in Italy, of various separate states gradually fusing into one nation and kingdom. The relief of the peninsula will partly show us why. Rugged highlands cover much of its surface, the chief ranges being the sheltering Balkans, which give their name to the peninsula, and stretch across it, south of the Danube, east and west. The height of these mountains varies from 2,000 to 8,000 feet. The highest are, therefore, above our own Alleghenies. Many other ranges branch off in different directions; the Pindus chain, striking southward, forms a sort of backbone in the narrower part of the peninsula. There are several large plains, the chief being the great plain of the Lower Danube. South of the Balkans is the plain drained by the Maritza river; and the plain of Thessaly lies east of the Pindus range. These, and many smaller plains, are much isolated and cut off from each other by the far-reaching mountains, across which it has been very difficult to make good roads.

Another chief reason why the different states which were gradually formed in these plains and on the hillsides have never really united is that the peoples who have settled and ruled in them belong to quite different races, with different speech, and, to some extent, different religion.

Twice in the centuries since the birth of Christ there has been a ruling power in the peninsula strong enough to keep for a time the various states more or less under its control and leadership. But an unconquerable desire for independence has led to grim and tragic warfare all through the years. Consequently, as we look at the map of this part of Europe as it is to-day, we have to remember that every mile of the wavy border lines that part the various countries in it have been fought for, lost and regained, often amid scenes of incredible cruelty. It is felt that some of those lines are even to-day not permanent.

GREECE, A FAMOUS LAND SHAPED LIKE A MULBERRY LEAF

Let us start at the southern end of the peninsula, the Morea, shaped like a mulberry leaf, the stalk that joins it to the mainland being the Isthmus of Corinth, which is now cut by a canal. The Morea, with the provinces to the north of it and many fairy-like islands, make up the far-famed country of Greece. We read of its heroes and its legends, its marvels and earliest history, in another part of our book; they all belong to its period of greatest glory in the times before the birth of Christ. This small country, especially the division of it called Attica, half the size of Long Island, with its famous city, Athens, has influenced the lives and thoughts of countless people for more than two thousand years, so great were the learning and the taste of those who lived and worked in it in the very far past.

We will take up its story when these most brilliant days were past, when it had been conquered, with other Greek-speaking provinces round the Sea of Many Islands, by the masterful Romans.

In the middle of the fourth century, Constantine, the Christian emperor, took the old Greek city of Byzantium, situated on the point where the rushing stream of the Bosphorus widens into the Sea of Marmora. A fine situation, thought the emperor: Asia in sight across the straits, a splendid harbour—the Golden Horn, we call it now—running seven miles inland.

HOW CONSTANTINE BUILT THE NEW ROME IN FULL SIGHT OF ASIA

And so he added to the city, built walls to defend it, and called it New Rome. But the name it has always borne is Constantinople—the city of Constantine—and it soon became the capital of the Eastern or Greek Empire, also called the Byzantine Empire. We see in the story of Italy how the great Roman Empire became weak, and how it split into two divisions, East and West, at the end of the fourth century.

Unhappily, differences arose between the Churches of the East and West, and so it came to pass that as Christianity spread over Europe in the centuries when the formerly wild peoples were settling down, these peoples joined either the Western Church, with the Pope as head, or the Eastern Church, ruled by the Patriarch of Constantinople. We have seen already that the English, French, Germans, were converted by missionaries from Rome. But the Slavonic peoples, and others of different stock who became very much mixed up with the Slavs, settling, as they did, about the Balkans and the Danube from the sixth century onwards, had most to do with the Eastern Empire, and so took their Christianity from the Eastern or Greek Church. Chief among these peoples were some whose names appear on our modern maps—the Bulgars, who settled between the Danube and the Balkans, and whose kingdom now reaches over the southern slopes of the mountains; and the Serbs, who settled to the west of them, in Servia, and other smaller states near the Adriatic. Many and sore were the struggles between the Eastern emperors and these settlers on the northern boundaries of their dominions.

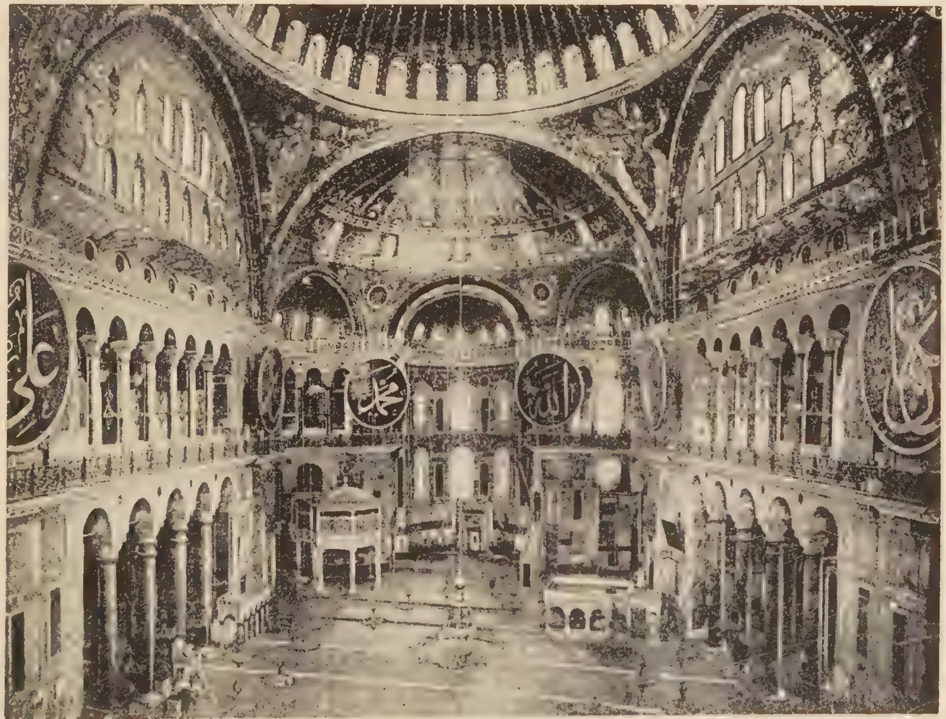
THE PEOPLE OF THE MOUNTAINS AND THE BUILDERS UP OF KINGDOMS

Let us look a little closer at the land on these northern boundaries. Then, as now, the noble Danube in its middle course rolled on full of water from the distant Alps and Carpathians, forming a splendid waterway from the plain of Hungary to the Black Sea. Then, as now, well-watered, fertile plains lay on each side of the river, shut in by the Hungarian mountains on the north and the Balkans in the south. The northern plain, with its sheltering slopes, became settled by tribes whose lands later became independent kingdoms, called Moldavia and Wallachia.

In the picturesque mountain country between the Black Sea and the Adriatic, a perfect ferment of peoples settled and fought and struggled with each other and with their neighbours, into whose hands they fell ever and again as the years rolled on. The kingdoms of the Bulgarians and Servians were particularly large and important, and towns and monasteries rose up among the mountains in the sunny valleys. Bosnia,

THE TRIUMPH OF PAGANISM IN THE EAST

The Roman Emperor Julian, who was the nephew of Constantine the Great, had been brought up as a Christian, but all the time he secretly admired the heathen gods of Greece and Rome, and when he became emperor he tried to restore the pagan worship. Because of this, he has been known in history as Julian the Apostate. He tried hard to win the Christians over to paganism by flattery and favour, and here we see him addressing a conference of Christians. It is said that on his death-bed Julian exclaimed, "Thou hast conquered, O Galilean!"



The wonderful mosque of St. Sophia, at Constantinople, of which we see the interior in this picture, was built originally as a Christian church, by the Emperor Justinian the Great, and it has always been the world's finest example of Byzantine architecture. When the Turks took Constantinople they turned it into a mosque, and so what had once been the most beautiful Christian church became the most magnificent sanctuary of the Moslem world. Round the walls may be seen large circular plaques bearing texts from the Koran.

too, managed to keep itself distinct, and to develop into a kingdom.

About the middle of the sixth century the names of three great men stand out—the heroic General Belisarius, the Emperor Justinian the Great, and the writer Procopius, who gives such a full account of their doings. Two great deeds of Justinian's were the revision of the old Roman law and the building of the noble cathedral of St. Sophia at Constantinople. By bringing the stern old laws of the empire more into harmony with the gentler religion of Christ, Justinian did much good for his own times; but not only that, so well and thoroughly was the work done that this revision of his has ever since been of the greatest value to those who are starting the study of law. With regard to his other chief work, twice had the cathedral of St. Sophia been burned down.

THE BUILDING OF THE WONDERFUL CHURCH OF ST. SOPHIA 1,400 YEARS AGO

Within forty days of the second disaster, Justinian started the re-building of the magnificent place of worship we can see to-day. Its shape is that of a Greek cross—the four arms of equal length—with a vast dome in the centre. Procopius speaks of the glorious colours of the marble pillars—taken from the old temples of Asia—green and purple, glowing red and glittering white; the bright sunshine from the many windows of the dome falling on beautiful mosaics and gorgeous gilding, and on a wealth of gold and silver plate and precious gems. Such was St. Sophia 1,400 years ago.

About half a century after Justinian, the Emperor Heraclius fought many campaigns against the Persians, far away on the banks of the Euphrates, in Asia; and the cause of the war was this: In Jerusalem—the city so sacred to Christians, and at that time part of the emperor's dominions—there was treasured up a piece of wood, believed to be part of the Cross. The Persians, who had long been encroaching on the emperor's borders, came and took this piece of holy wood away. Heraclius, after much fighting, succeeded in getting it back from the Persians, and, returning to Constantinople, he laid it before the altar of St. Sophia, before restoring it to its shrine in Jerusalem.

About fifty years before the Persian war a strong man, belonging to an Arab tribe, was born at Mecca, and brought up by his uncle. He was a reformer, for he taught the Arabs, or Saracens, to give up idolatry, and to form themselves into one nation.

MOHAMMED'S LETTER TO THE KINGS OF THE EARTH, & THE PERSIAN KING'S REPLY

His new religion taught that there is but one God; that both the Jewish and Christian religions had come from God, but that he, Mohammed, was sent to teach a more perfect faith still, and to force it upon the whole world. Mohammed sent a sort of circular letter to the kings of the earth calling upon them to embrace this faith. The Persian king answered that he would put the prophet in chains when he had time; Heraclius made no direct reply, but sent some small presents.

It is almost impossible for us to realise the force and fury with which the followers of Mohammed set forth to conquer the world to their faith by the sword. They not only did not fear death, but wanted to be killed if only they had slain an "unbeliever" first. For they firmly believed they would then be safe and sure of perfect happiness in the world to come.

It was this fierce spirit in the Saracens—for so they were called as they spread, conquering, far and near—that caused them to be so greatly dreaded. Province after province in Asia fell to them, including Jerusalem, and the holy wood was hastily taken back to St. Sophia. The magnificent walls of Constantinople saved it for another three centuries, but nearly all the time the emperors of the East were engaged in fighting the followers of the prophet.

THE TWO BRANCHES OF THE CHRISTIAN CHURCH BREAK APART

During these years the two branches of the Christian Church were ever drifting wider apart. Latin ceased to be a common tongue, and the Roman element became less and less strong. The Greek language and literature were more widely cultivated, and many scholars were at work in monasteries and schools, often in remote spots out of the way of the turmoil of incessant war. For, besides the struggle with the Mohammedan Saracens and

SOME FAMOUS RULERS OF BYZANTIUM

Belisarius, the Byzantine general, died in poverty. Legend says that, being blinded, he wandered about with a youth for guide, and the youth being killed by a snake, Belisarius carried the body, not realising he was dead.

The emperor under whom Belisarius served was Justinian the Great, who married a performer named Theodora. Theodora was very beautiful, but although wise and courageous, she was also arrogant and cruel.

Desiring a wife, the Emperor is said to have called the most beautiful maidens to his palace, and with a golden apple to give to the lady of his choice, he selected Casia, but by a pert reply to a remark of the emperor she offended him, and passing on he selected Theodora for empress, giving her the apple.

Turks, who followed them, the empire was beset with wild tribes pressing in from the north. Such were the Russians, who united in a single horde about the middle of the ninth century, and worked their way to the Black Sea. They made raids on the Bosphorus, and ravaged Bulgaria.

To make matters worse, there were a great many feeble and wicked emperors, stone-blind to the pressing needs of their times, who allowed their great inheritance to slip out of their weak and idle hands. Occasionally a strong man arose, such as Basil II., in the same century that saw the Norman conquest of England. Basil managed to subdue a strong compact against him formed by Bulgaria and Servia inland, and Macedonia by the sea. His cruelty was horrible, and gained him the name of the "Slayer of the Bulgarians." He moved back the border of the empire to the Danube; but his successors were weak and unworthy, and quite unable to resist the onward rush of the Seljouk Turks from the East, who, having become Mohammedans, gained Asia Minor and Jerusalem.

THE DESTRUCTION OF CONSTANTINOPLE AND THE SCATTERING OF ITS TREASURES

To this day pilgrims make their way, often on foot, from all the countries round, to visit the sacred shrines in the Holy City, and it was the tales of the bad treatment of the pilgrims long ago that roused Europe to start the Crusades.

The Fourth Crusade, headed by Baldwin of Flanders, fell very far short of the high aims with which these "Holy Wars" began. Detained for a while at Venice while waiting for ships to carry them eastwards, the Crusaders were persuaded to take up the private quarrels of the Venetians, and in the end they helped them to besiege Constantinople. The city was taken on the second attack, and the inhabitants were treated with terrible cruelty; their beautiful city was sacked, and the art treasures that Constantine and his successors had gathered together were ruined. To make paltry coins, the most beautiful bronze statues the world has ever seen were cast into the melting-pot. So "Christians" of the West treated Constantinople of the East.

Baldwin was elected emperor; but his rule was not for long. The Venetians and the Genoese, bent on enriching themselves by trade, shared various islands and ports between them. The large island of Crete, with its steep mountains dark with evergreen foliage and its smiling valleys, fell for a time to Venice.

During the last century of the existence of the once mighty but now dying empire, its great destroyers, the Ottoman Turks, or Osmanli, under their crescent banner, were gradually carving their way to the heart of the empire, Constantinople. The Asiatic provinces, the chief islands and ports, fell one by one, and still on they came.

THE MARCH OF THE TURKS INTO EUROPE, AND THE DOOM OF THE QUARRELLERS

The story of how the Turkish Crown Prince with eighty followers crossed into Europe on rafts is most thrilling. At the narrowest part of the Dardanelles—no wider than a good-sized river—they succeeded in gaining a fort, the first foothold of the Ottoman Turks in Europe. Before many years had passed, towns, villages, valleys, all fell to the conquerors—even Adrianople, the second city of the empire, situated in a beautiful and fertile valley. There were several causes which helped on the Osmanli besides their own daring and power in arranging the best ways to fight. The rulers of the old empire were weak and foolish; the Balkan Christians were fiercely destroying each other while the hour of their doom was coming nearer; and the other Christian peoples around, the Venetians, Genoese, Hungarians, Poles, Austrians, were too disunited, too busy with their own affairs, to join heart and soul against the powerful invaders at their gates.

BOYS OF CONQUERED PEOPLES DRILLED TO FIGHT AGAINST THEIR COUNTRIES

Sigismund of Hungary headed a force when the Turks burst through the Balkans; but they were too strong for him, and, afterwards, he was much taken up with persecuting John Huss, who was later put to death, and his followers. Later, the brave Hunyadi, with the Poles, defeated the Turks, but was afterwards in his turn defeated at that bloody battle of Kossovo.

Constantinople in these days was more and more becoming a city-state instead of the heart of a once mighty empire, and the Turks were more and more determined to have it for their

THE DOWNFALL OF CONSTANTINOPLE

Few big cities have been besieged and taken so many times as Constantinople. Since the middle of the sixth century it has undergone no fewer than twenty-six sieges and has been captured eight times. But its most terrible experience was in 1204, when it was captured by the Crusaders, as shown here. The city was given up to pillage; and the so-called Christian warriors acted more barbarously than any Turkish invaders have ever done.

The capture of Constantinople by the Turks in 1453 was another terrible experience for the ill-fated city, and about 60,000 men, women, and children were sold into slavery and dispersed all over the Turkish Empire. But the fall of Constantinople was not merely an ordinary historical incident, or simply the triumph of Crescent over Cross; it had more far-reaching effects than any other event in modern history, for by driving scholars with their books into Italy from the East, it helped the great revival of learning, and this again led to the Reformation.

capital; so all the time they were increasing their ships and their army. One way of increasing the strength of the army was to make the conquered Christian peoples give up the finest of their boys. These boys were brought up as Mohammedans, and drilled to fight against the countries which had given them birth. These troops were the famous Janissaries, or new soldiers, who helped so largely to destroy the Eastern Empire, and who, later, gained so much power over the sultans.

THE TAKING OF CONSTANTINOPLE, AND THE LAST CHRISTIAN SERVICE IN ST. SOPHIA

The ruins of the thick walls of Constantine's city show how strong were the defences when Constantine XI., the last emperor, stood bravely in the breach against Mohammed II. He knew the end was near, and at midnight had taken the Sacrament in the beautiful church of St. Sophia. Then, after a short rest in his ruined palace, he sadly mounted his horse and rode away amid the sobs of the crowd to the post of danger. Before long the besiegers made their entrance over his dead body. The streets were deserted, for the people had gathered in St. Sophia in frantic prayer, expecting a miracle to save them. Alas ! a piteous wailing went up as they were dragged out to be killed or sent to slavery, and then, only a few hours after the celebration of Constantine's last act of Christian worship, the loud voice of the Mohammedan crier rang out through the huge building : " God is great, and Mohammed is His prophet." This was on May 29, 1453.

St. Sophia still stands in its grandeur, and many of its beautiful mosaics still tell of its Christian past, though for more than four centuries it has been used as a Mohammedan mosque.

THE FLIGHT OF THE LEARNED MEN, AND THE BIRTH OF THE NEW LEARNING

This conquest by the Turks of the old Greek Empire, and particularly that of Constantinople, caused the flight of many students and learned men, with the manuscripts they so much loved, towards the West, chiefly to Italy. In Florence, Lorenzo the Magnificent gathered round him men who were interested in the old Greek manuscripts and in the wonderful old Greek art. The knowledge of these writings and of this art had been shut up so long in the East that when the study of them was revived it was called the New Learning, and the New Birth of Art. Many scholars from all over Europe journeyed to Italy in those days, and returned to their own countries to fire others with enthusiasm for the study of Greek and its wonderful literature. " I have given my whole soul to Greek learning," writes Erasmus, the friend of More and Colet, from Paris, " and as soon as I get any money I shall buy Greek books—and then I shall buy some clothes."

During the years that followed the taking of Constantinople, the crescent on the Ottoman banner shone triumphantly over an immense and powerful empire from the Danube to the Euphrates, from the Caspian Sea to the Straits of Gibraltar. The discipline and unity of purpose of the Mohammedans prevailed against the jealousies and quarrels of the Christian kingdoms. Deeds of daring and heroic resistance on their part were not wanting, and there were terrible revolts and massacres ; but so bitter were the jealousies between Christian rulers, so intense the hatred between the East and West branches of the Church, and between Catholics and Protestants, that not only was there no united front against the followers of Mohammed, but on several occasions Christians sought alliance with them against their fellow Christians.

THE SULTANS OF TURKEY, AND THE MAGNIFICENCE OF SULEIMAN THE GRAND

Among the Turkish rulers—who came to be called sultans—were many strong and clever men. One of the greatest was Mohammed II., who had ridden over Constantine's body and up the nave of St. Sophia on that eventful day in May, 1453. He ruled for thirty years, and conquered Servia, Bosnia, and Greece.

Suleiman the Magnificent lived at the same time as the trio of Western kings, Henry VIII. of England, Francis I. of France, and Charles V. of Germany. An old German song shows the terror which this " Grand Turk " cast over the Holy Roman Empire. It says : " The furious Turk has lately brought great forces into Hungary ; from Hungary he has quickly entered Austria in the light of day ; Bavaria is his for the taking, thence he presses onward and may soon come to the Rhine, for which cause we have no peace or rest."

THE BATTLE OF LEPANTO, WHERE TURKEY LOST HER SEA-POWER

For more than a century after the capture of Constantinople the Turkish Navy was thought to be invincible. But at the battle of Lepanto, in 1571, Don John of Austria, a son of the Emperor Charles V., so routed the Turkish fleet that Turkey for ever lost control of the sea, and her conquering progress in the West was stopped. The Turkish fleet consisted of 277 ships and 120,000 men. The Christian forces were made up of the fleets of Venice, Spain, the Pope and the Knights of Malta, but it was Don John's skill that won the day.

It was said of Suleiman that while he ruled, sword and pen were never dry, so continually was he fighting, and so great was the number of writers in his day. It was he who swore he would take no rest till the prayer of the prophet rang out from the tower of St. Stephen's Church, in Vienna. But his quarter of a million Turks were obliged to retire from the gallant city, and so the spread of the Turkish power in the valley of the Danube was checked for a while.

A LONG LINE OF WEAK AND CRUEL RULERS OF THE CONQUERING TURKS

A few years after Suleiman's death, at the great naval battle of Lepanto, a limit, too, was set to Turkish power in the Mediterranean and upon the sea generally.

After this came a succession of weak and cruel rulers, and under them there were wars with the Persians, mutinies of the Janissaries, who had become a very rich and strong body, and other disasters. Ottoman power rose again for a time under the able rule of a family named Kiuprili, many of whom acted as prime ministers, or chief viziers. It was under one of these men that the Turks determined to try their fortune again at Vienna. Enormous preparations were made, and alliances renewed with most of the surrounding nations, so that the emperor should be left without help.

The vast hosts advanced, spreading terror and desolation in their way. Then they encamped before Vienna. The peasants had crowded into the city from the country round. There was but a small garrison, the old walls were out of repair, and the Turks, the best engineers and artillerymen in Europe, soon undermined them and drove off the emperor's soldiers.

THE STEADY EBBING OF THE TURKISH POWER IN EUROPE

At last, after two terrible months, when it seemed only a question of days before the Turkish general would gain the glory of receiving the submission of the devoted city, a troop of Poles was seen hastening down the vine-clad slopes, shouting "Sobieski for ever!"

The terror of the name of this gallant King of Poland, who had inflicted such terrible defeats on them before, filled the Turks with a panic, and they fled on all sides, leaving immense treasure behind them. The siege was raised, and the Turks were driven out of Austria. There is a picture on page 2850 showing the victorious Poles after the scattering of the Turkish camp.

Since this September day in 1683 the tide of Turkish power in Europe has steadily ebbed. No more did the sultans threaten and terrify the whole world, though they still had some successes, and continued for many years to keep in wretched bondage and misery the Christian nations of the Balkan Peninsula.

The Turks were driven out of Hungary; many towns and islands in the Mediterranean were taken from them; Greece passed for a time to the Venetians before entering on its long final struggle for freedom against the Turks. The Russians, now growing into a Power in Europe, captured Azov, on the Black Sea, and by degrees its northern shore passed into their hands. Ships on the Black Sea meant power to threaten Constantinople, and perhaps too much influence in all the four seas that wash the shores of the various Balkan countries.

THE GREAT CHANGES THAT CAME WITH THE GROWTH OF RUSSIA'S POWER

With the growth of Russia's power came the right to interfere in the provinces north of the Danube, particularly Moldavia and Wallachia, which were dependent on Turkey. This country's frontier fell back to the Dniester, then to the Pruth, and for many years the old kingdoms were alternately under Russia and Turkey.

The growth of Russia had a great effect in restoring to power the Eastern or Greek Church. It had years of depression while it was the religion only of the oppressed and ever-rebelling subjects of the sultan, and of the Russians, who were few in number. But as the Church of a chief Power in Europe, it bound that Power in sympathy with its poorer brethren of the smaller and despised nationalities, and gave many chances of encouraging their revolts.

How these revolts helped to bring freedom, and how they failed, we read in the next STORY OF COUNTRIES, where also we read the amazing story of Turkey's efforts to set herself free.

THE NEXT STORY OF COUNTRIES IS ON 3219

JACK AND THE BEAN-STALK

CONTINUED FROM 3124

A very poor widow woman once lived with her only son, Jack, in a little cottage on the border of a great wood. They were so poor that often Jack went supperless to bed; and at last things got so bad that Jack's mother made up her mind to sell their cow, the one possession they had left. So, when market-day came round, Jack set out, driving the cow before him, determined to make the best bargain he could.

On the way he met a man with a bag of beans in his hand. Jack took such a fancy to the beans that he begged the man to give them to him.

"No, indeed," replied the man. "They are magic beans. But you shall have them in exchange for the cow."

To this the boy readily agreed. The man took the cow, well pleased with his bargain; and Jack ran home to show the beans to his mother. The poor woman wept when she heard the story, and was so angry at Jack's stupidity that she flung the beans out of the window.

Jack went to bed very cross that night, but when he got up the next morning he was surprised to find something in front of his window. It looked like a huge tree; but, on going nearer, he found that during the night the wonderful beans had twined together and grown to a tremendous height; indeed, the top of the stalk was almost out of sight.

In a twinkling Jack sprang up the bean stalk. Higher and higher, and still higher he climbed, until he began to lose his breath. When he at last reached the top, he found himself in a strange country. He walked along a little way, and presently met an old woman. Jack had never seen her before; but, to his great surprise, she said:

"I know you quite well, Jack. Years ago a wicked ogre killed your father and stole all the money which should rightly belong to you. This ogre lives close by; and if you want to punish him, I can help you."

Jack replied that he certainly did want to punish the ogre, and asked where he lived.

"In that great castle over yonder," replied the old woman, who was a witch, and with that she vanished.

Jack made his way to the castle which the old witch had pointed out, boldly mounted the steps, and rang the bell. A woman opened the door; and Jack asked for a night's lodging.

"Alas!" replied the woman, "I dare not take you in. My husband is an ogre, and if he finds you he will surely kill you and roast you for supper."

"But can you not hide me?" asked Jack, who was no coward.

"I will do my best," said the woman; "but you must promise to go away the first thing in the morning."

When Jack had promised, she took him into the kitchen and gave him a good meal; but before he had finished, there came a tremendous knock at the door.

"Quick!" cried the woman. "Jump into the oven, and don't make a sound till my husband has gone to bed."

In scrambled Jack; and a minute later the ogre strode into the room.

"Wife," he cried out, in his terribly loud voice, "I can smell fresh meat!"

Jack trembled at the voice of the ogre.

"Nonsense, my dear!" he heard the wife say. "See what a fine supper I have prepared for you."

The supper was so good that the ogre instantly sat down and made a good meal, and when he had finished he told his wife to bring in his favourite hen. She went outside, and returned with a beautiful hen, which she set down on the table.

"Lay an egg!" commanded the ogre; and the hen instantly laid a golden egg.

"What a useful bird!" thought Jack.

Jack reached the bean-stalk, and began to climb down it quickly with the harp, while the ogre followed in hot pursuit.

Soon after this the ogre fell asleep, and snored so loudly that his snores shook the walls. As soon as Jack heard them, he crept out of his hiding place, picked up the hen, and ran away. On and on he ran until he reached the bean-stalk, which he climbed down as fast as ever he could go. When he reached the bottom he flew to his mother and told her what had happened. The widow was overjoyed, and called Jack her "brave boy." They sold the golden eggs which the wonderful hen had laid, and lived very comfortably for some time on the money they were able to get for them.

But after a while Jack began to long for more adventures. So one day he disguised himself as well as he could, climbed up the bean-stalk, found his way to the castle, and again asked the ogre's wife to give him food and lodging. But the woman shook her head, and said that the last time she had befriended a poor boy the ungrateful wretch had repaid her by stealing the ogre's favourite hen. But Jack begged so hard that at last she consented, and this time hid him in a cupboard.

Presently the ogre returned to the castle. As he entered the kitchen, he cried out in a terribly loud voice:

"Wife, I smell fresh meat!"

"Nonsense, my dear!" replied his wife, as before. "See what a fine supper I have prepared for you."

The ogre sat down and ate his supper. When he had finished, he roared:

"Bring me my money-bags!"

His wife brought the bags, and laid them on the table. The ogre counted his money, put the coins back into the bag, and then fell asleep. Out jumped Jack, caught up the money-bags, ran out of the castle, and was soon back again in the cottage.

"You need not mind spending all this money, mother," he said, pulling the bags out of his pockets one after the other, "for that bad man stole it from my father, and it is all our own."

Some time after this Jack once more climbed the bean-stalk and made his way to the castle. This time he dare not let the ogre's wife catch sight of him, but after waiting about for some hours he managed to slip in and conceal himself in the copper just before the ogre returned.

"Wife, I smell fresh meat!" roared the ogre, directly he set foot in the kitchen.

"Oh, no!" replied his wife. "You are always fancying there is someone in the house. This time I am certain you are mistaken."

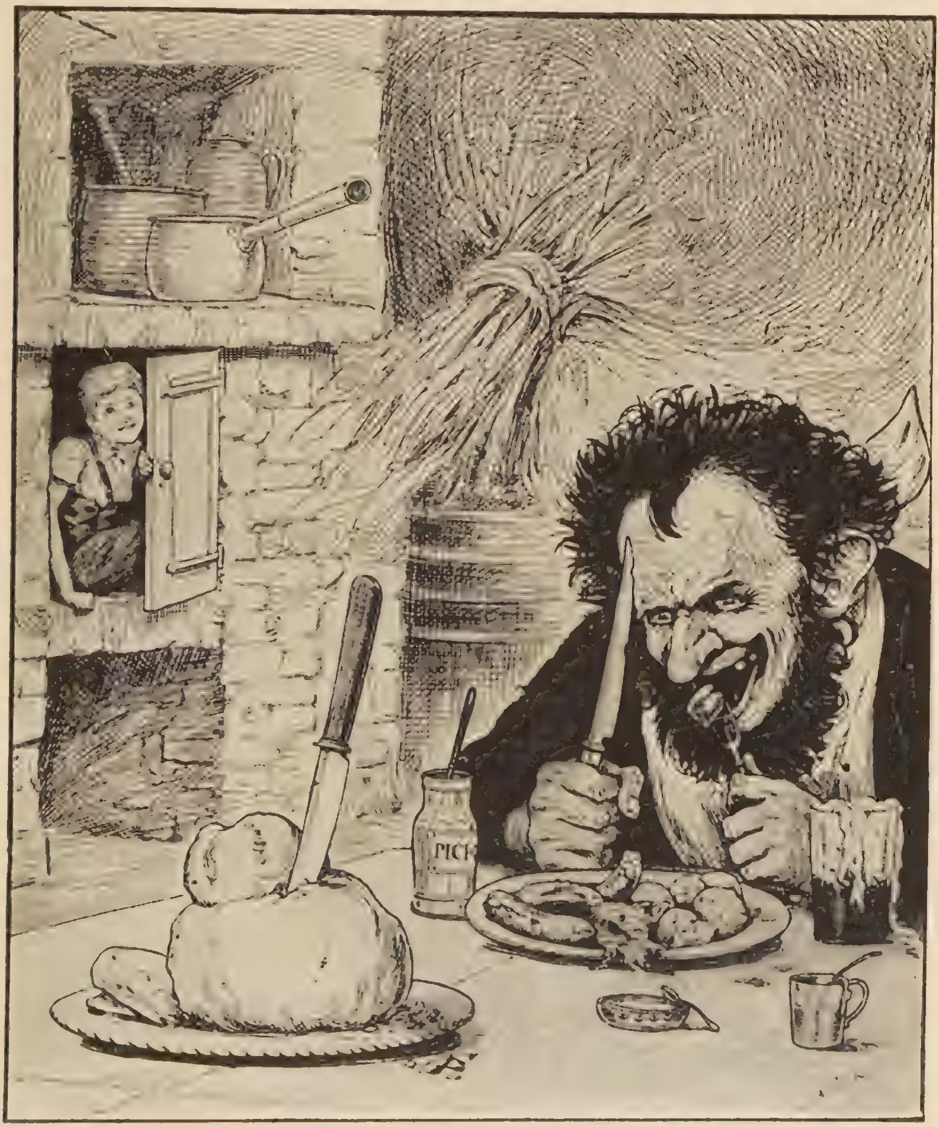
When the ogre had eaten his supper, he called for his harp. His wife brought it and set it on the table, and at a word from the ogre it began playing by itself. This so pleased Jack, who was peeping over the top of the copper, that he determined to have it.

As soon as the ogre was safely asleep, Jack jumped up, seized the harp, and flew out of the room. But the harp was a fairy harp, and directly Jack picked it up it shrieked out:

"Master! Master!"

The ogre woke up instantly. He started up, and, seeing what had happened, rushed after Jack, who was running away as fast as his legs would let him. He reached the bean-stalk, and began to climb down quickly. When he reached the ground, the ogre was nearly half-way down. Jack saw that there was not a moment to be lost. "Mother! Mother! Bring the hatchet. The ogre's coming down!" he shrieked.

Out rushed Jack's mother. Jack seized the hatchet, and with a single blow cut the bean-stalk right through. Down fell the ogre with a frightful crash, and so ended his wretched life.



WHILE JACK LAY HIDDEN IN THE OVEN THE GIANT ATE A GOOD SUPPER

Jack and his mother lived many happy years after this. When Jack grew to be a man, he fell in love with a beautiful princess and married her, for by that time Jack was rich and his adventures had made him famous.

HOW TRUTH GOT TO THE BOTTOM OF A WELL

Ding, dong, bell!

Tommy Lin let go his hold, and Pussy descended with a rush into the darkness of the well.

"Pussy's in the well!" screamed everybody on top.

"Who threw her in?" squeaked the mice.

"Little Tommy Lin," cawed the rooks.

And while they shouted on top, Pussy fell, and fell, and fell.

"Now for the bump," she sighed, as the dark and oily floor of the well rushed up at her through the water.

But instead of a bump, she fell into the lap of a Spinster, who was sitting on a marble bench, with a little lamp burning at her side. The Spinster looked calmly down on Pussy, fondled her ears, and stroked her soft fur, and smiled at her.

"Well, I never!" said Pussy. "How did you get here? Did that little rapscallion of a villain, Tommy Lin, throw *you* in, too?"

The Spinster shook her head.

"Who are you?" asked Pussy.

"I am called Truth."

"Indeed! And how did you get here, pray?"

"Democritus placed me where you found me."

"And who was he, to be sure? Grandfather of Tommy Lin, I'll be bound."

"Democritus," replied Truth, "was one of the greatest philosophers of antiquity. He devoted his life to discovering facts. Instead of living in Athens and enjoying himself like the other philosophers, he spent his days in searching for facts. He journeyed to Europe, Asia, and Africa—all to get facts. And when he got back to his native city of Abdera, he took up his dwelling in a cave in a garden just outside the city, and there spent his life laughing at the foolish notions of ignorant people."

"Did he, though?"

"The people thought he was mad, and sent the learned doctor Hippocrates to have a talk with him. But when Hippocrates came away, he said that it was not Democritus who was mad, but his accusers. Democritus, he said, did quite right to laugh at the absurdities and follies and stupidities of ignorant, superstitious people. It was a mad world. Democritus was about the only sane man alive."

"If I had my way with the human race," said Pussy, "I wouldn't laugh at them, but I'd convert the whole lot of them into mice, and say to my family: 'Enjoy yourselves.'"

"The human race has learned a great deal since Democritus," replied Truth; "and you mustn't judge them from your experience of Tommy Lin. They are trying their best. And though they keep me here in this dark, gloomy, and hidden place, you will certainly never hear me express any feeling for them except the feeling of pity."

"Why did Democritus place you here?"

THE SPINSTER LOOKED CALMLY DOWN ON PUSSY, AND STROKED HER SOFT FUR

THE PEOPLE THOUGHT DEMOCRITUS WAS MAD, AND SENT HIPPOCRATES TO TALK WITH HIM

" He said that he had searched everywhere for Truth, and could not find her, and that, therefore, she must be at the bottom of a well. Everybody said: 'Ah, that is quite true; we shall never discover Truth; she lives at the bottom of a well.' They were rather glad than otherwise. But some of the honest people in those days began at once to look into wells to find me; and, as I want to be discovered, I had to take up my residence in some well or another, or else never be discovered at all. So I chose this well, whose name is Inquiry, and where I noticed the most honest men were inclined to look. But for Democritus, I should never be here at all. He has imprisoned me; but he has located me. I am hidden; but men know where to look for me. I am not angry with Democritus. He was an honest man."

" And how do you spend your days, ma'am?" inquired Pussy, glancing round for mouse-holes. " Is it dull at all?"

" Seekers after truth," replied the lady, " are continually sending down little buckets which have interrogation marks for hooks. These little questioning buckets, made by the labour of scholars and thinkers, are too small to contain me myself, but I fill them with as much of the sacred water of Knowledge as they will hold. That is how I spend my days."

" If the stupids only knew you were here yourself!" Pussy remarked, as she glanced inquiringly at Truth.

" Oh, there are plenty of people among them who would stop the inquirers from sending down a bucket big enough to hold me, even if it were possible to make one. I am not a welcome guest on the earth to a very great number of important people. Some of them say that even to inquire after me is wicked. Most of them are afraid of me. It is only the few who know that the business of life is to discover Truth."

Pussy looked wise, and rubbed one ear with her paw. " What you say is true," she said.

" It is!" rejoined Truth. " Some of the people on earth are so intent upon getting riches that they will do anything to attain them. These people, more than any others, do not like me. I have been a stranger to them for so long that very few of them would recognise me now."

" Now, *I'd* like to live with you all my life," replied Pussy. " But, there, I'm a cat; there's some sense about me!"

Just at that moment down came a bucket. Before Truth could say " Jack Robinson," let alone fill the bucket, in sprang Pussy, and, giving the rope a pull and exclaiming " Top floor, please!" without a single word of farewell or explanation to Truth, she shot up to the top.

" If there were mice down there, it would be a different matter," said Pussy, as she reached the surface, and began casting about an anxious glance to see if she could discover Tommy Lin.

THE TIGER, THE BRAHMIN AND THE JACKAL

Once upon a time a Tiger was caught and shut up in an iron cage. He tried in vain to get out through the bars and rolled and bit with rage and grief when he failed.

By chance a poor Brahmin came by.

"Let me out of this cage, Brother Brahmin," cried the Tiger, "let me out for one minute only to drink a little water, for I am dying of thirst." The Brahmin replied: "No, I will not, for if I let you out of the cage you will eat me."

"Oh, father of mercy," answered the Tiger, "in truth that will I not; I would not be so ungrateful; only let me out, that I may drink some water and return."

Then the Brahmin took pity on him and opened the cage door. Immediately the Tiger leaped out and roared: "Now I will eat you first and drink the water afterward." But the pious Brahmin pleaded: "Do not kill me hastily. Let us first ask the opinion of six, and if all of them say it is just and fair that you should eat me, then I am willing to die."

"Very well," the Tiger agreed, "it shall be as you say; we will first ask the opinion of six."

So the Brahmin and the Tiger walked on till they came to a Banyan Tree.

"Banyan Tree, Banyan Tree, hear and give judgment," said the Brahmin.

"On what must I give judgment?" asked the Banyan Tree.

"This Tiger," said the Brahmin, "begged me to let him out of his cage to drink a little water, and he promised not to hurt me if I did so; but now that I have let him out, he wishes to eat me. Is it just that he should do so?"

The Banyan Tree replied coldly: "Men take shelter under the cool shade of my boughs from the scorching rays of the sun. When they have rested, they break my branches and scatter my leaves about. Let the Tiger eat the man, for men are an ungrateful race."

At these words the Tiger would have killed the Brahmin instantly, but the Brahmin said: "Tiger, Tiger, you must not kill me yet, for you promised that we should first hear the judgment of six."

"Very well," said the Tiger, and they went on their way.

After a while they met a Camel.

"Sir Camel, Sir Camel," cried the Brahmin, "hear and give judgment."

"On what shall I give judgment?" asked the Camel.

And the Brahmin related how the Tiger had begged him to open the cage door, and promised not to eat him if he did so; how he had set the Tiger free and the animal refused to keep his promise. "Is that just or fair?" asked the Brahmin. The Camel replied: "When I was young and strong and could do much work, my master took care of me and gave me good food; but now that I am old and have lost all my strength in his service, he overloads me and starves me and beats me without mercy. Let the Tiger eat the man, for men are an unjust and cruel race."

The Tiger would then have killed the Brahmin, but the Brahmin said: "Stop, Tiger, for we must first hear the judgment of six."

So they both went again on their way. At a little distance they found a Bullock lying by the roadside.

"Brother Bullock, Brother Bullock, hear and give judgment."

"On what must I give judgment?" asked the Bullock.

The Brahmin answered: "I found this Tiger in a cage, and he prayed me to open the door and let him out to drink a little water and promised not to kill me if I did so. But when I let him out he resolved to put me to death. Is it fair he should do so or no?"

The Bullock said: "When I was able to work, my master fed me well and tended me carefully, but now I am old he has forgotten all I did for him and left me by the roadside to die. Let the Tiger eat the man, for men have no pity."

Three out of the six had given judgment against the Brahmin, but still he did not lose all hope, and determined to ask the other three.

They next met an Eagle flying through the air.

"O Eagle, great Eagle," cried the Brahmin, "hear and give judgment."

"On what must I give judgment?" asked the Eagle.

The Brahmin stated the case, but the Eagle answered: "Whenever men see me they try to shoot me; they climb the rocks and steal away my little ones. Let the Tiger eat the man, for men are the persecutors of the earth."

Then the Tiger began to roar and said: "The judgment of all is against you, O Brahmin." But the pious one, sad at heart, pleaded: "Stay yet a little longer, for two others must first be asked."

Soon they met an Alligator, and the Brahmin related the matter to him, hoping for a more favorable verdict. But the Alligator said: "Whenever I put my nose out of the water, men torment me and try to kill me. Let the Tiger eat the man, for as long as men live we shall have no peace."

Just then a Jackal came along.

"Why, what's the matter, Mr. Brahmin?" asked the Jackal. "Why are you so sad?"

Then the Brahmin related the whole story and asked the Jackal for his judgment.

"It is impossible for me to decide who is in the right and who is in the wrong unless I see the exact position in which you were when the dispute began," said the Jackal. "Show me the place."

So the Brahmin and the Tiger returned to the place where they first met, and the Jackal went with them.

"Now, Brahmin," said the Jackal, "show me exactly where you stood."

"Here," said the Brahmin, standing by the iron cage.

"Exactly there, was it?"

"Exactly here," replied the Brahmin.

"Where was the Tiger then?" asked the Jackal.

"In the cage," answered the Tiger.

"How do you mean?" said the Jackal. "Just where were you in the cage, Friend Tiger? Which way were you looking?"

"Why, I stood so," said the Tiger, jumping into the cage, "and my head was on this side."

"Very good," said the Jackal; "but I cannot judge without understanding the whole matter exactly. Was the cage door open or shut?"

"Shut and bolted," replied the Brahmin.

"Then shut and bolt it," said the Jackal.

When the Brahmin had done this, the Jackal said: "Oh, you wicked and ungrateful Tiger! The Brahmin opened your cage door to let you quench your thirst. Why did you not keep your promise? How did you show your gratitude? Stay there for the rest of your days. I hope no one will ever let you out again. Proceed on your journey, Friend Brahmin. Your road lies that way and mine this."

So saying, the Jackal ran off in one direction and the Brahmin went rejoicing on his way in the other.

LE MALIN FERMIER ET LE NAIN

Un fermier qui possédait une petite colline sur ses terres, ayant decidé qu'elle ne devait pas servir à rien, se mit à la labourer. Aussitôt un nain qui l'habitait en sortit et, furieux, demanda au fermier de quel droit il osait déranger son repos en labourant le toit de sa demeure. Le fermier s'excusa humblement, mais remarqua qu'il serait dans l'intérêt de tous deux que la colline fût labourée et qu'on y récolta une moisson.

Le nain refusa d'abord, mais le fermier fit de son mieux pour le convaincre. Il proposa de tout faire lui-même à la condition que le nain consentît à ce que, la première année, tout ce qui pousserait au-dessus du sol fût au fermier, et tout ce qui serait dessous au nain; et la seconde année, ce qui serait au-dessous, au fermier, et au-dessus, au nain.

Le nain consentit à cet arrangement; mais le malin fermier planta du blé la première année et abandonna les racines au nain, tandis qu'il prenait le grain; et la seconde année, il planta des carottes, qu'il récolta en laissant au nain le feuillage inutile.

LEGENDS OF ENGLISH PLACES

A legend means a very old story, often so old that we cannot tell whether it may ever have been true. Perhaps most stories called legends may have some truth in them, but as a rule they are to be read just as we read fairy tales. Histories are stories of facts, legends are stories that may have been facts, but most likely were not.

THE LUCK OF EDENHALL

EDENHALL is the country seat of the Musgrave family. Its greatest treasure is a strange drinking glass, which came into its possession in a wonderful way.

One midsummer night a troop of fairies were holding their revels in the grounds of Edenhall, when one of the Musgraves disturbed them. They hastened away, leaving behind them, on the grass, one of their drinking cups. Then, as the intruder stooped and picked it up, the fairies said:

If this cup should break and fall,
Farewell the luck of Edenhall.

So the cup is called the "Luck of Edenhall," and great care is taken to preserve it from all injury.

THE PITS OF WOOLPIT, IN SUFFOLK

JUST outside the little village of Woolpit, in Suffolk, there are some curious pits, or trenches. One autumn, when the reapers were gathering the harvest in the fields close by, a boy and a girl came up out of the pits. They were wonderful children. Their bodies were of a green colour, they were dressed in a strange stuff, and they spoke in an unknown tongue. Nobody could understand them, but a kind woman adopted them and brought them up.

At first they would eat nothing but beans, and the boy pined away and died. The girl, however, grew hale and handsome, and learned to speak English, and was married to a farmer.

She said that she came from the country of St. Martin, which was a Christian country, and contained many churches. No sun ever shone there, and the people lived in a dim twilight; but across the river by which they dwelt they could faintly see a region of sunshine.

"One day," the girl said, "I and my brother were tending our father's sheep by the riverside, when we heard the sound of bells, like the bells of Bury St. Edmunds. Then all at once we found ourselves in the pits of Woolpit.

No one has yet discovered the twilight land of St. Martin, and the pits of Woolpit are now almost filled up.

THE NEXT STORIES ARE ON PAGE 3203.

THE FAIRY FOUNTAIN OF KILLARNEY

IN days gone by, the valley of Killarney was covered with rich cornfields and pleasant pastures, and in the middle of it was a fairy fountain. This fairy fountain had to be sealed down with a flagstone, to prevent the water from rushing out; and every morning and evening the pretty daughter of the farmer of Killarney went with her serving-maids and took the flagstone from the fountain. When the maids had filled their pitchers, she carefully put the stone back again.

One evening, just as the maids departed with their pitchers, a handsome knight rode up to the fairy fountain, and began to make love to the farmer's pretty daughter. She forgot all about the flagstone, and went wandering with the knight on the hills, amid the rocks and bushes. Suddenly she remembered, and ran wildly down the hill to seal up the fountain. But it was too late. The valley was flooded with water, and over the cornfields was a calm and beautiful lake. Happily, no one was drowned, and, as the knight married the farmer's daughter, and took them both to live in his castle, the farmer was not troubled by the loss of his lands.

THE GIANTS AND THE ISLE OF MAN

THE Isle of Man is a large and beautiful island lying in the sea between England, Ireland, and Scotland. They say it was made in a very strange way. There was once a red-haired giant in Scotland who was always boasting that he was the strongest creature on earth, but a giant in Ireland challenged him, and they met at Lough Neagh to fight.

There was a terrific struggle, and the Scottish giant got the worst of it, and fled. As he leaped into the sea and swam towards England, the conqueror sent him a parting gift. Thrusting his gigantic hands into the earth, he tore up a vast mass of rock and clay, and threw it at the Scottish giant. But he missed him, and the vast mass sank and became an island. King Man, father of King Lear, afterwards lived there, so it was called the Isle of Man.

THE ARAB PATRIOT OF ALGERIA

CONTINUED FROM 3010

Abd-el-Kader, whose name means "servant of the mighty God," was an Arab of Algeria, born in 1807, and a man of remarkable character. With a fine and graceful figure, and a body of great strength and endurance, he was unsurpassed in courage, profoundly learned, and had high standards of duty and honour. He had, too, a powerful influence for good over all with whom he came in contact. When a young man of twenty-six, he left his life of study and religious meditation to lead his people as Sultan against the French invaders, and for fourteen years he tried to free Algeria from the foreign yoke, and form a great Arab nation.

Alone, or with a few horsemen, he would appear in a remote part of the Atlas Mountains, or in the Sahara, and rally thousands to him. When the French anticipated an attack in their rear, he would suddenly appear in front, as we see in the picture. He could shoot accurately while standing in the saddle, with his black Arab horse speeding like lightning; or he would enter a town and harangue the servile townsfolk into defence of their country and religion. He treated his prisoners as guests, sending them money, clothes, and food. Formerly, Arabs had killed their prisoners. Some women were once captured and brought to him, and as he set them free he exclaimed in anger: "Lions attack strong animals; jackals fall upon the weak." Often Abd-el-Kader and his brave followers had insufficient food, or galloped for days together over the desert sands. Once when they were living on acorns, a stray sheep was brought to him. "Take it to my starving soldiers," said the leader.

But the resources of France were limitless, and though many armies were sent in vain, 100,000 disciplined troops in the end overcame the little remnant of the Arab forces. Even then, when Abd-el-Kader wandered with hardly a follower, such was the terror of his name that the French had to keep a large army on foot.

Not until his cause was utterly hopeless, in 1847, did this brave man surrender, on condition that he and his family should be free to live in Alexandria or St. Jean d'Acre. That promise was not fulfilled, for he was kept a patient prisoner in France for many years. They offered him wealth, a château, a guard of honour; but he indignantly refused them, demanding that France should redeem her pledge. In 1852 Louis Napoleon saw that this was done, and he was set free.

In 1860 a Turkish mob rose against the Christians of Damascus, where Abd-el-Kader was then living. With some Algerian soldiers he saved the lives of 15,000 people. From that time honours and distinctions were heaped upon him, until his death, in 1883.

THE GIRL WHO SOLD HER HAIR

At the time when Napoleon was trying to conquer all Europe, and state after state was falling a prey to his grasping ambition, Silesia, a German territory, was doing her best to beat back his invading armies. Everyone in that freedom-loving state was wrought up to a passion of ardent patriotism in the terrible year of 1813, giving all he could to the cost of equipping an army for defence.

A Silesian girl had no fortune to put at the service of her country. Her small possessions were of hardly any value, yet she burned with eagerness to help her countrymen in their fight against the invader.

One day the idea came to her that she might sell her thick, long hair, and so obtain some money. She accordingly set off to Breslau, where she sought out a hairdresser, and offered him her tresses. He could not understand why she should want to part with her beautiful hair, so she had to tell him the reason. Then he agreed to cut off her hair, but could not afford to give more than two dollars for it. The bargain was made, the hair was cut off, and the girl returned home.

The hairdresser was so touched with this instance of self-sacrifice that he would not part with the hair in the usual way, but used it in making various ornaments such as bracelets. The story of what this Silesian maiden did for her country became known. All Silesia was proud of the act, and articles made of her hair were eagerly bought. So much were they in demand that the hairdresser reaped a golden harvest, and contributed a large sum to the state.

A PRINCE WHO GAVE UP HIS FREEDOM

In the Middle Ages, Ceuta, which lies just opposite Gibraltar, on the northwest coast of Africa, was a hot-bed of piracy, and King João of Portugal and his sons made an expedition to it, captured it, and released the Christians imprisoned there. Eighteen years later, in 1433, King João died, and soon after two of his younger sons, Henrique and Fernando, laid siege to Tangier, a town farther along the coast.

But the Moors, with their allies, surrounded and entrapped the little army. They were unable to reach their boats, had no food, and were forced to give to the Moors a hostage for the delivery of Ceuta. Prince Fernando offered himself, and then his brother had to leave him. Their elder brother, the King of Portugal, sent a fleet to Ceuta, but nothing was done, and Prince Fernando remained a prisoner.

Soon the Moors were angered that no ransom was sent, and that Ceuta was not yielded to them, so in revenge they maltreated and starved the prince. Now, his mother was Philippa, the daughter of John of Gaunt of England, who had brought up her son to be a man worthy of his knighthood. So Prince Fernando bore his troubles patiently, enduring all so that Ceuta might remain in the hands of his Christian countrymen.

The king, his brother, tried to raise an army to free him, but he caught the plague by which Portugal at that time was being desolated, and died from it. His little child, aged six, became king, and quarrels disturbed the land, and thus, as the years passed by, hope of release for patient Prince Fernando grew less and less.

Two kings in Spain, however, touched with admiration and pity for him, planned to attack Tangier and release him, but that only led to his being sent to the King of Fez inland. He put the prince first in a dungeon without light or ventilation, and then made him labour among Christian slaves. But Fernando was so kind to them, and behaved so nobly, that even the King of Fez expressed admiration for him.

After ten years in prison for the honour of his country, brave Prince Fernando died. The Portuguese hold his memory very dear, and call him Prince Constant. The poet Calderon, too, wrote a great play, and made him the hero of it. And though his life was seemingly offered in vain, Ceuta has ever since belonged to the Christians; for when it ceased to belong to Portugal, it passed into the possession of the Spaniards. Thus, what Prince Fernando gave his life for was really accomplished — the rule of a Christian prince at Ceuta.

The next Golden Deeds are on page 3253.

GOLF FOR BOYS AND GIRLS

CONTINUED FROM 3070

GOLF is one of the few outdoor games in which boys and girls can compete on equal terms.

A golfing outfit for a boy or girl consists of four clubs, which are called a driver, a cleek, a mashie, and a putter, and they should be carried in a light canvas bag. The driver is a wooden-headed club; the cleek, mashie, or "lofter," and putter are iron headed; and the cost of each is from a dollar up. In addition there should, of course, be two or three golf-balls.

The driver is used for driving off from the tee; the cleek is for an "approach" shot—that is to say, for the intermediate shot, or shots, less than a hundred yards in distance, and taken between the spot where the ball rests after we have made our drive and its arrival at the green. The mashie, or lofter, is employed in place of the cleek if the lie, or position, of the ball is awkward—if, for example, it is in a hole or has rolled into a bunker, or is lying on very rough ground. Owing to the curious shape of the head of the mashie, it is specially useful for "lofting" the ball up out of a difficult place, which is done by striking the ball very low down, almost from underneath, in fact. The putter is used when the ball is on the green, to play it into the hole.

A match usually consists of two players. When four players play together the match is called a "foursome," each pair of partners in this case sharing a ball, and taking it in turns to strike. An ordinary full-sized golf-links consists of eighteen holes, each of which is set in the middle of a putting-green, and it is the object of the player to get the ball into each hole in fewer strokes than his or her opponent.

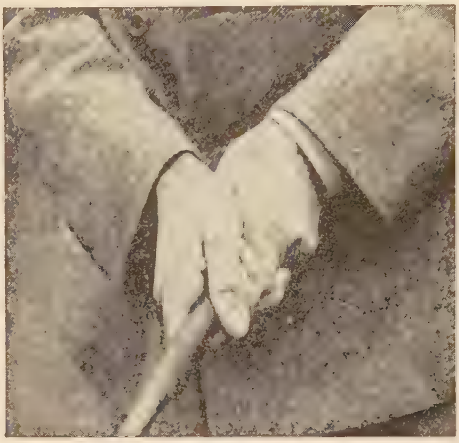
Close beside each putting-green there will be found a teeing-ground—a small, flat, slightly raised platform, which is provided with a box of sand and an indicator showing the direction of the next hole. Now, a proper golf-links is laid out in such a manner that the direct line from each teeing-ground to the next hole is comparatively clear of obstacles, so that by correct play it is possible to reach the putting-green surrounding the hole without getting into difficulties; any deviation from this straight course, however, will be found to lead the player into trouble. His ball will get into a bunker, either natural or artificial, for most golf-links are provided with specimens of each kind.

A belt of low-bushes, a ditch, a pond, a shallow trench filled with a layer of sand and with a bank of earth running the length of it on the opposite side, all make suitable bunkers, and the difficulty of getting through, or over, or out of any of these hazards, when once one is in them, will be readily understood. The player's principal object therefore is, firstly, to learn to hit a ball true in the centre with the middle of the club-head, so that it may travel straight, not "slicing" or pulling it to right or left, or topping it, so that, instead of soaring away for a hundred and twenty to a hundred and fifty yards, as it should do easily, before coming to earth, if properly hit, it pitches dead into some obstacle a short distance away, whence it can only be extricated after endless trouble. Often there is a bunker between the player and the straight line to the hole, but this is placed in such a position that a correct shot should carry the ball over it towards the green.

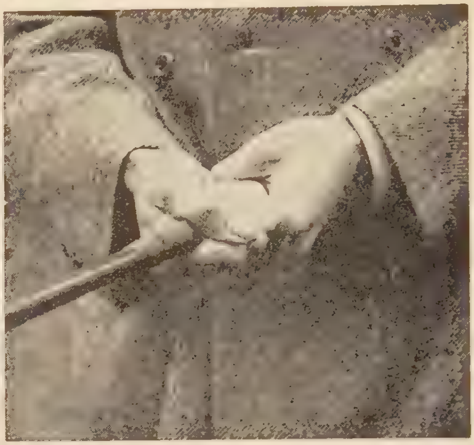
To begin the game, we must prepare to drive off from the teeing-ground. The first thing to do is to make a tee with a small handful of sand, pressing it together with the fingers to form a small pyramid. Upon the top of this the ball is lightly balanced, in order that the player may have a fair shot at it. Beginners usually like a rather high tee, while a practised player will use scarcely any.

It is important first of all to study the correct way to hold a club. It must be grasped in the fingers with both wrists above, and must not be held in the palms of the hands. A glance at the pictures on pages 3170 and 3171 will teach us more than any written description. In driving, the *left* hand is the guiding force, the master hand, and in taking hold of the club the left hand must grasp it first, and the right hand be afterwards placed below it in the position shown. In order to drive off from the tee we must stand in an easy position just opposite the

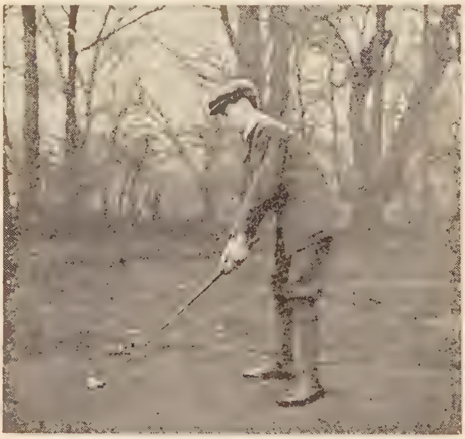
GOLF AND HOW TO PLAY IT



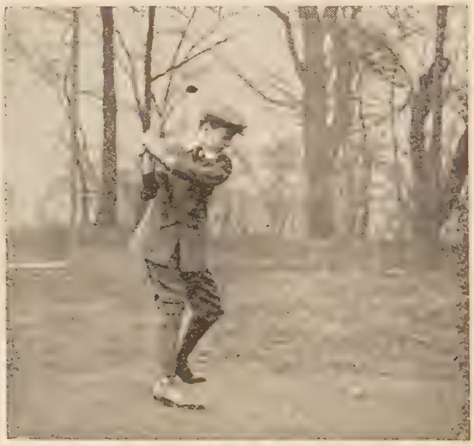
The right way to grip a golf-club is shown in this picture. The club must be held in the fingers and not in the palms of the hands. The left hand guides the stroke.



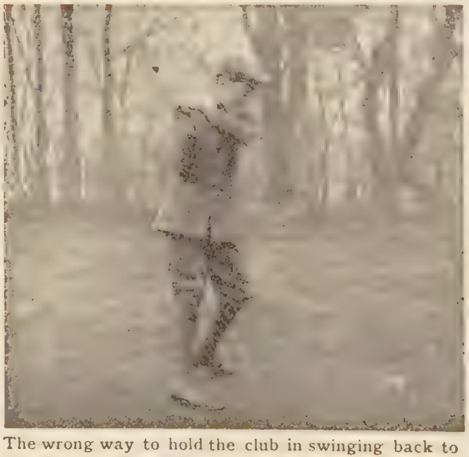
This picture shows the wrong way to hold the club. The wrists here are not properly over the handle, and the position and grip of the hands are quite wrong.



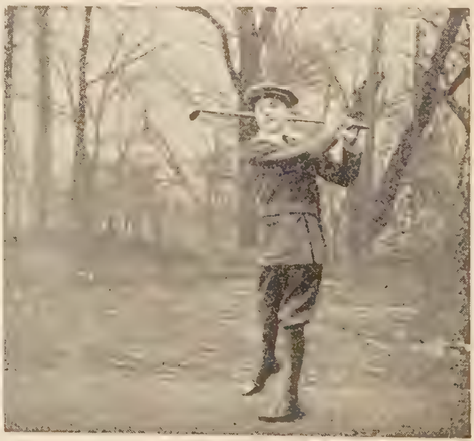
Here we see a player standing in the correct attitude and addressing the ball before taking his drive.



This is a view from behind of the player swinging back in driving, the wrists being held well under the club.

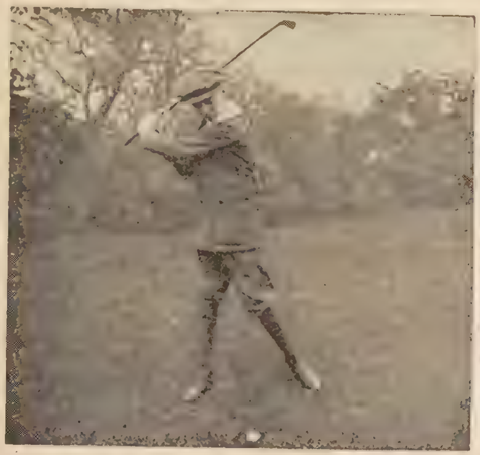


The wrong way to hold the club in swinging back to drive is shown here. The left wrist being over instead of under the handle, the player could not hit straight.

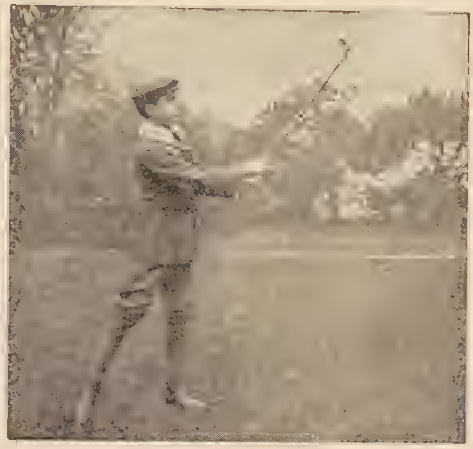


After striking the ball the club must continue its swing, ending well behind the head, the weight of the body being transferred from the right to the left foot in striking.

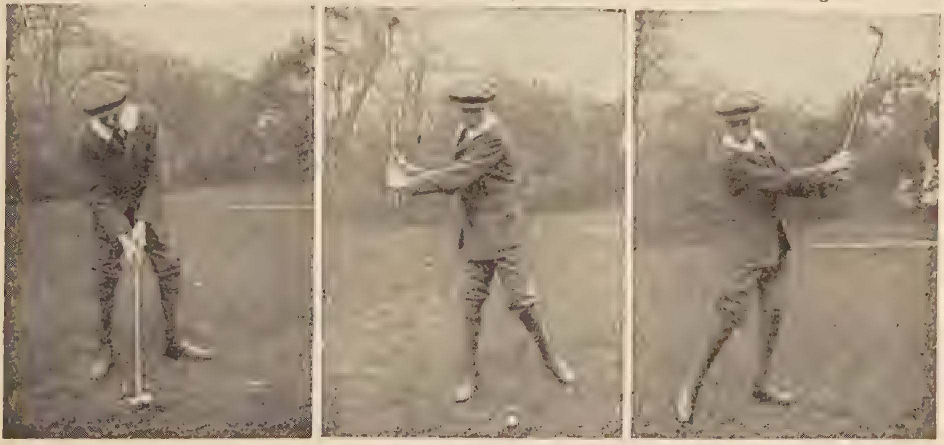
A HEALTHY GAME FOR BOYS AND GIRLS



The player in this picture is using the cleek, which is not carried so far back before striking as the driver is.



The stroke with the cleek is carried through in the same way as with the driver, but is not swung so far round.



These three pictures show the stroke with the mashie, a club adapted for "lofting" a ball over an obstacle. In the left picture the player addresses the ball; in the centre he is swinging back for a full shot; and the right-hand picture shows the finish of the stroke. Note that the player keeps his eyes on the spot where the ball was.

The putter is used on the green for knocking the ball into the hole. The player here is addressing the ball.

Here the player has struck the ball, which is about to drop into the hole, having run perfectly straight.

These photographs were taken at the Golf School, Royal Botanical Gardens, London, by permission of Mr. Norman Salmond, the manager.

ball, and at a convenient distance from it, with feet about a foot and a half apart, the weight of the body being distributed evenly between them. We must now "address" the ball, or act as though we were going to strike it, once or twice, to loosen the muscles of the shoulders and wrists, and judge the distance.

Then, standing with spine straight and stiff, head and neck bent a little forward, knees slightly bent, and eyes fixed on the spot just behind and beneath the ball, we swing the club up and behind the back of the neck until it lies almost across the back of our shoulders. Our entire weight meanwhile is transferred to the right foot, whilst the left foot rises upon the toe with the left knee turned inwards. The backward swing thus taken finally blends into one long, continuous movement. With the forward swing the shoulders come completely round and the weight passes from the right foot to the left, the right foot rising upon the toe, and the right knee turning inwards as we sweep the ball off the tee in the course of the swing and follow its direction with the club, our eyes still fixed on the spot where the ball was for at least a second after it has been swept away. The finish of the stroke finds us in the position seen in the picture, with the right shoulder swung completely round and pointing in the direction in which the ball has travelled, and the club laid flat across our shoulders. The club, during the full swing of the drive, describes an almost complete circle.

In playing the approach shot, or shots, with cleek or mashie, the same principles of keeping the eye on the ball and the same backward and forward swing are employed, the latter, however, in a less degree, the club being carried up only as far as the shoulder instead of high behind the head, in a half or three-quarter circle only.

Taylor, the famous golf champion, impresses strongly on all his young pupils that the whole energies of the player must be concentrated on the stroke being played, and not wasted in worrying about past bad strokes. The situation must be thoroughly thought out before each stroke is taken, and a plan of campaign should be decided upon when a ball has to be got out of a bunker.

The ball having reached the green, the position in which the putter is to be held is a matter to be left almost entirely to the discretion of the player. Caution and steady play cannot be too strongly recommended when on the putting-green, and we should never attempt to hole out in one shot unless the distance be a very short one.

The etiquette of golf is very strict, and the following rules must be carefully obeyed:

A player going round the links alone must always give way to a properly constituted match. No player, onlooker, or caddie should move or talk during a stroke. Players looking for a lost ball must allow other players coming up behind to pass them. Turf cut or displaced by a stroke must be replaced in position at once. No player should play from the tee until the party in front has played the second strokes and is out of range, and we must never play up to the putting-green until the party in front has holed out and moved away.

Among the most important rules of the game of golf are the following:

When the balls are in play the ball farthest from the hole which the players are approaching shall be played first, each player keeping his own score, except in a match, when each player keeps his opponent's score. The ball must be struck fairly, not pushed, spooned, or scraped, under penalty of the loss of the hole. A ball must be played wherever it lies, or the hole must be given up; any *loose* stones or earth within a club's length of the ball may be removed, but the player may not move, bend, or break anything fixed or growing near the ball. Loose obstructions may be removed from any part of the putting-green. A ball shall be considered lost if not found within five minutes after the search for it is begun. If a ball is lost the player loses the hole.

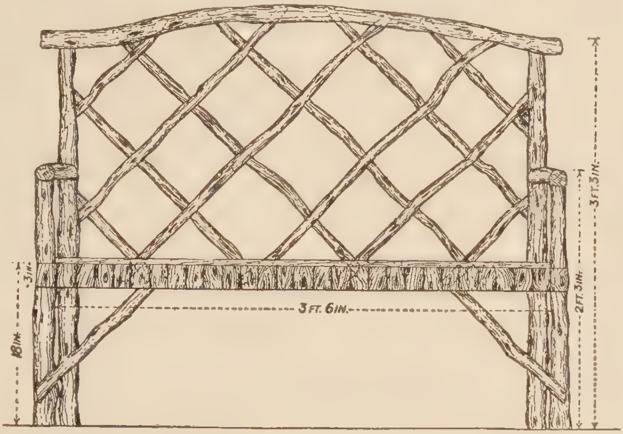
A SERVIETTE-HOLDER MADE FROM CURTAIN-RINGS

A DAINTY and ingenious little serviette-ring can be made in the following way. We get eight brass curtain-rings measuring about one inch across, a crochet-hook, a ball of brighteye or lustrine, and about three-quarters of a yard of silk ribbon, just wide enough to pass through the rings without crumpling. The colour of the thread should match that of the silk. The brass rings are first covered with the thread by crocheting over them. We first make a loop, then put the hook through the ring to make "an over," and then on the outside of the ring make an over, and draw this through the two loops already formed. When the ring is covered, and a neat, even chain shows round the outer rim, we draw the thread once through the last loop, pull it tight, cut it off, and work the end in and out with the hook so that it cannot come loose. We then lay the eight rings in a row, overlapping each other, and pass the ribbon through the second ring as it lies under the edge of the first one. Next we bring the ribbon over the edge of the first ring, and thread it through the third ring, as it lies partly under the second one. The picture shows how this threading is done. The ribbon comes out over one side of a ring after dipping under the opposite side. Having brought the ribbon through the last ring, we tie the two ends neatly in a bow. The ribbon may be quite thin, but it is well to get one with a corded edge, because it wears better.

The serviette-ring

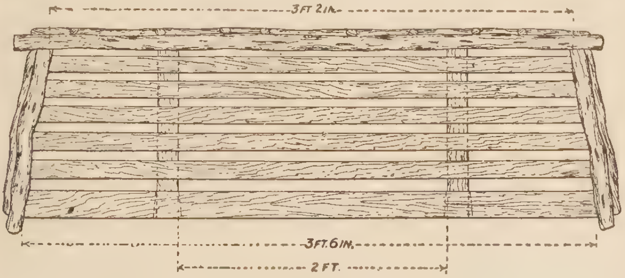
MAKING A GARDEN SEAT

A GARDEN seat is an object that can be made indoors at any time, in readiness for summer use on lawn or garden. It is very easily made and affords scope for various pretty designs, especially in rustic work, the materials for which can be obtained at the woodcutters' sheds where faggots and brushwood are sold. A pretty seat may also be made wholly of *slats*, or thin strips, on a framework of wood or of iron. Out of several designs one is selected and illustrated in this article.



1. A front view of the garden seat

Pictures 1, 2, and 3 illustrate a seat in which rustic work is combined with a square framing. Picture 1 is a view looking from the front, picture 2 shows it as one looks down upon it from above, and picture 3 is an end view. This style of seat is selected because it is easier to make than one in which the framing is built of crooked pieces of timber. With squared wood one has no difficulty in getting the essential framing level, square, and strong, and we would have difficulty should we attempt to mortise and tenon or nail pieces of wood of all shapes together.



2. The garden seat as seen from above

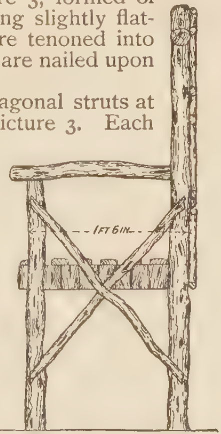
For the framing, which is seen in picture 4, we buy what is termed *quartering*, measuring 3 inches deep by 2 inches wide in cross section, which saves us the trouble of sawing it out of planks. We smooth it over with a plane and cut off lengths as shown, which, of course, we may make longer or shorter as we please. The method of fitting only is important. There are two sides, two ends, and two middle stretchers.

The framing for the seat has to be fitted to four uprights, which can be made of quartering or of fir-pole, as shown in the pictures. The fitting of these must be good, or the seat will be unsteady. At 18 inches from the bottom, flat faces will be cut on the uprights at right angles with each other, and on these mortises will be marked and cut, as shown in picture 4. Tenons will be cut on the ends of the seat quarterings to fit these mortises very tightly. The end of each tenon will terminate at an angle of 45 degrees, termed a mitre. These ends will abut within the legs, and this abutting contributes very much to the steadiness of the fitting. The legs of kitchen tables are fitted in exactly the same way. After being fitted, the tenons and mortises are well brushed with white-lead paint, driven in tightly and well screwed or nailed. Previous to this the central stretchers will have been fitted into place and wedged as shown. This completes the only troublesome part of the work. The remainder can be made of rustic material in any way we may desire.

Two pairs of sloping pieces or angle-struts are shown supporting the middle part of the seat in picture 1. These are nailed to the front and back pieces of quartering and to the legs. Elbow-rests, as seen in picture 3, formed of round poles, each being slightly flattened on one side, are tenoned into the back uprights and are nailed upon the front ones.

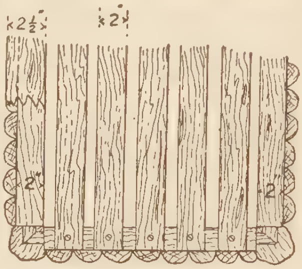
We must also fit diagonal struts at the ends, as seen in picture 3. Each resists the pressure coming from a direction opposite to its own, and thus renders the seat as steady as a rock. They are made of rustic branches cut to angles of 45 degrees at the ends, and nailed or screwed, preferably the latter, to the legs.

The back can be made of a crooked



3. The end of the seat

branch, not necessarily of the shape shown, and nailed or tenoned to the back uprights. It will be stiffened by the crossing rustic work at the back, the appearance of which may not be just like the drawing, but will depend on the shapes of the material which we can procure. These may be nailed or screwed, but screwing always makes a firmer job.



4. Framing of the seat

The seat is made of six slats of ½-inch or ¾-inch board, which may be purchased cheaply at the sawmill, or they can be sawn out of matchboarding. Oak is best, but pine will do. They are nailed with openings between to allow the rain to run away, and are slightly rounded on the top for the same reason. Here the essential work of the seat is finished. But its rustic appearance may be much improved by nailing short lengths of half-rounds all around the edges of the quartering, as shown. They will extend from the top of the slats to about 1 inch below the quartering. Or if straight pieces of half-round branches can be procured, these can be used, one in front, one at back, and one at each end. They are less troublesome to fit than the smaller upright pieces.

The whole seat may be painted, but a clear varnish, applied with a brush, is preferable.

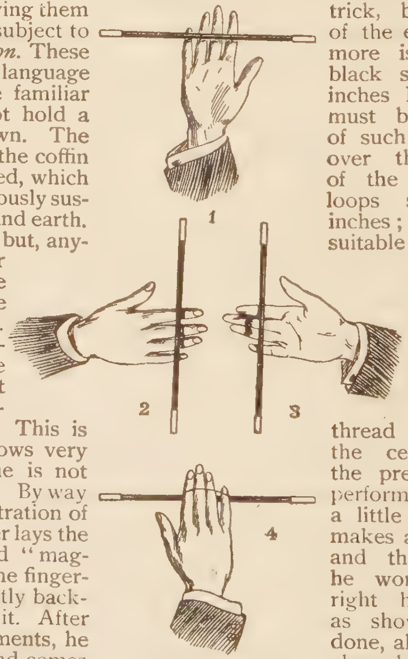
THE SELF-SUSPENDING WAND

The young conjurer has seen on page 3068 how to make a magic wand and to produce it, in a magical way, from his purse. But it may not always be convenient to do this. He may not have the right sort of purse, or his purse may be so full, say, at Christmas time, as to leave no room for the wand. In such a case he may be glad to be able to give some other proof of its magical qualities, and one very good way of proving them is to show that it is not subject to the *attraction of gravitation.* These are big words, but in plain language they merely indicate the familiar truth that, if you do not hold a thing up, it will fall down. The only known exception is the coffin of the Prophet Mohammed, which was said to hang, miraculously suspended, between heaven and earth. Even that tale is not true; but, anyhow, the young conjurer can work a similar miracle on a humble scale with the aid of his magic wand.

A good way of introducing the trick is to make a few remarks about what is called "animal magnetism," or mesmerism. This is a subject that nobody knows very much about, so that one is not likely to be contradicted. By way of giving a practical illustration of his miracles, the performer lays the wand upon the table and "magnetises" it by drawing the finger-tips of the right hand lightly backwards and forwards along it. After doing this for a few moments, he raises the hand. The wand comes with it, as shown in the first picture, as if held up by some magnetic force. He waves the hand about, but the wand does not fall.

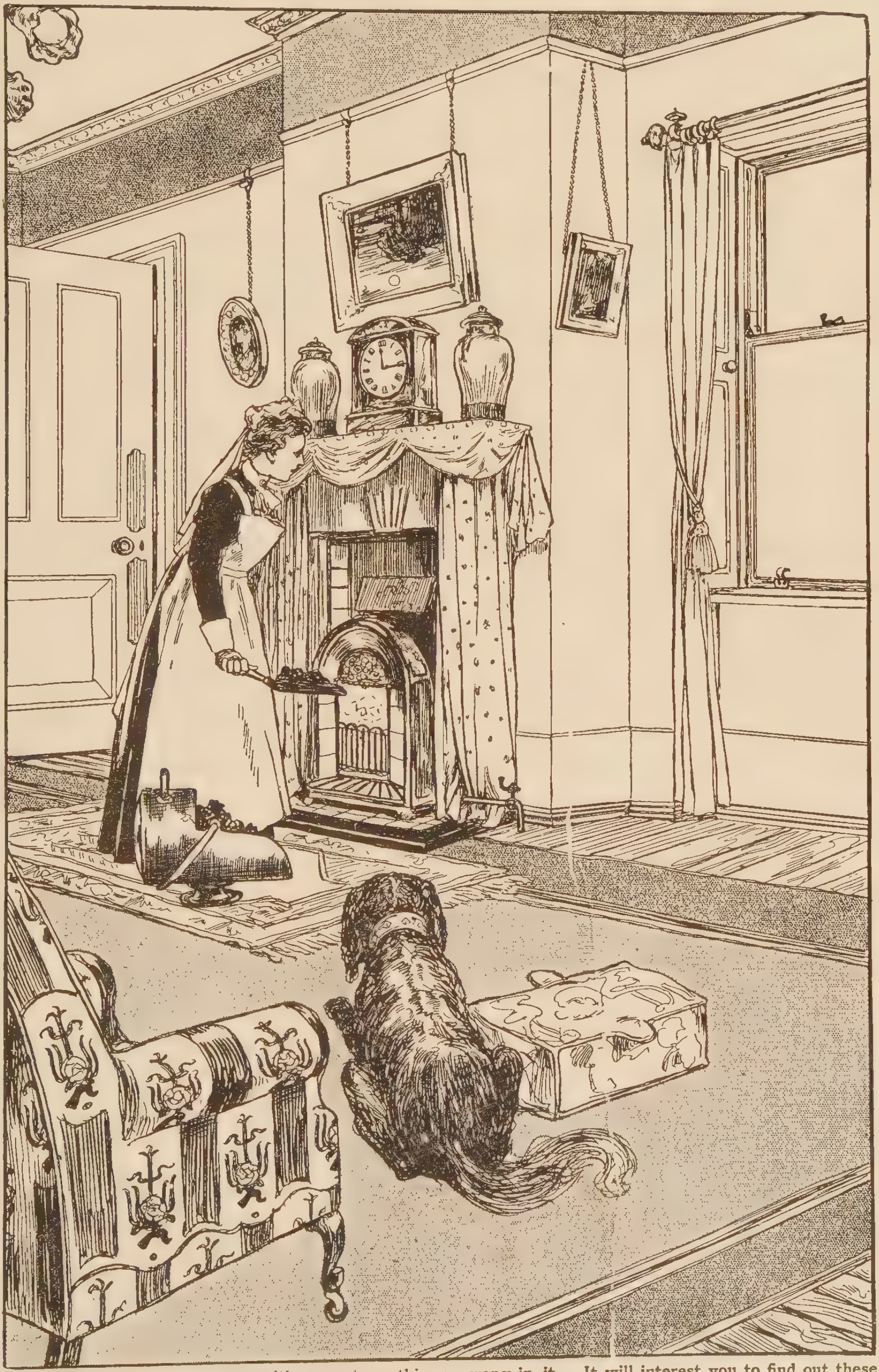
Tilting it into an upright position, as shown in picture 3, he removes the second and third fingers, leaving it in contact with the fore and little fingers only. Thence he transfers it to the left hand, and, to make the matter still more surprising, shows that it will hang just as well from the backs of the fingers, as shown in picture 2. After a minute or two he pretends to feel that the magnetic influence is getting weaker, and presently the wand falls to the ground. He picks it up and offers it for examination, but the closest inspection fails to discover anything to account for its very surprising behaviour.

There are various ways of working the trick, but for the production of the effects described, nothing more is needed than a bit of black silk thread, about seven inches long. Each of the ends must be formed into a loop, of such a size as to slip easily over the wand. The length of the silk between the two loops should be about four inches; the exact length most suitable will depend upon the size of the performer's hand, and must be ascertained by experiment. To prepare the wand for use, the two loops are passed over it and drawn apart, the intermediate portion of the thread lying straight along it at the centre. Under cover of the pretended magnetising, the performer brings the two loops a little nearer together. This makes a space between the wand and the thread, and presently he works the fingers of the right hand under the thread, as shown in picture 4. This done, all the rest is easy. At the close he has only to draw the wand through the hand, thereby sliding off the thread, which may be allowed to drop on the floor. At a distance of three or four feet the thread, by artificial light, is quite invisible. The performer must, however, always take care to keep the two loops on the black portion of the wand, and the back of the hand turned away from the spectators.



Using the wand

WHAT IS WRONG IN THIS ROOM?



This picture has been drawn with seventeen things wrong in it. It will interest you to find out these mistakes and write them down, comparing your list with the correct list appearing on page 3285.

A LITTLE VEGETABLE GARDEN

WHAT TO SOW AT THE END OF APRIL

Our chief concern must still be seed sowing, and something that is very useful to grow, and does not need much space, is parsley. Parsley should have a deep, well-worked root-run, and the seed should be thinly sown. It does not come up quickly, therefore it may need watering if the soil gets very dry.

What herbs shall we grow? First and foremost there may be thyme — sweet smelling, and always in request in the kitchen. It flourishes in a warm, sunny position. Sage may also find a place, and is sure to be wanted when ducks are to be cooked and stuffed. We shall not require many plants of this, as they grow to a large size, and one will supply many twigs.

Another useful herb is mint, or peppermint, and here, too, a couple or three well-grown plants will, in all likelihood, be found sufficient.

Some of us may want to grow potatoes. One of the first questions as to their cultivation, naturally, is: When should they be planted? The planting season for this vegetable is a long one. Roughly speaking, in different parts of the country it extends from March until May. Much depends upon the kinds of potatoes grown, and it may be said that those potatoes that are to be eaten as new potatoes, which are dug from the ground as they are required, may be planted earlier than is necessary for those that are to occupy the ground until autumn, when they are dug up and stored for winter use. On the whole, the potatoes that are dug up early, the new potatoes, will be the more convenient for our little gardens, because they occupy the ground for a much shorter period. Generally speaking, in all districts these should be planted by the end of March, but the fear of frost cutting the tops when they have appeared through the ground makes it necessary to plant according to weather and district. The main crop of potatoes may be planted now or later; good crops have even been grown from tubers put in as late as June.

Now comes another question: How deep shall we put them in? This is a question on which there are many opinions, some say three or four inches, others say five at least; and each row must be a foot and a half to two feet apart, those grown as new potatoes the first-mentioned distance or even a little less, and the tubers themselves about eight inches from each other in the rows for new potatoes, and a foot at least if for late ones.

We must not forget our potatoes in frosty weather when they have peeped through the ground, for the young shoots are decidedly tender; if there are but a few plants, it may be possible to arch them over with sticks, and throw some sacking over on frosty nights. But if the frost should catch them, it is an excellent plan to be before the sun and sprinkle them with cold water, but it is of little use to do this if the sunshine has already reached them.

There is another hint that must be given here. When the plants are well above the ground, and have made a few inches of growth, we may carefully bank the soil up around them on both sides.

Some of us will, no doubt, wish to grow rhubarb. We have to remember that when in full summer growth it requires ample space; all the same, it is a profitable and highly satisfactory crop to grow, and the plant is a bold, handsome one. Young plants may be put in during April, and the sooner the better. If dry weather follows the planting, a good watering should be given occasionally. String (or snap) beans, may be planted if the weather is warm. They should be placed several inches deep, and a foot apart, for the bushes of the dwarf or "bush" varieties grow strongly; beets and carrots and oyster plant may go in, too, in long, shallow drills covered lightly, but pressed firmly into the soil with a board, and we must be careful not to pull out the seedlings of the last plant, thinking that they are grass blades, for they closely resemble upshooting grass. Second plantings of peas may follow, and also lettuce. Then the early varieties of sweet corn or maize must now be sown. These are generally dwarf, and the grains may be planted rather sparsely, and rather deeply in long rows. Or they may be grown in hills, four or five grains being dropped in each hole, and the hills at least a foot apart.

So far celery has only been mentioned, but to grow celery may indeed be the ambition of some young readers. For an early crop the seed is sown in a greenhouse or on a hot-bed, but as young gardeners often have to dispense with these, it is the later celery crop that we must attempt. The seed may be sown out of doors now, on good ground which has been deeply dug and manured. We must watch the seed carefully, and when the seedlings appear not let them suffer for lack of moisture. The great secret of having a good crop is to keep the plants always growing, they must not stand still, as it were, and it is very necessary to keep them clear of weeds. Later on there is transplanting to trenches, then, still later, an operation known as *earthing up*, and we must remember that it is a little difficult to grow this crop really well — all the more credit if we succeed.

THE NEXT THINGS TO MAKE AND DO ARE ON PAGE 3279

A FIRST TALK ABOUT TREES

THE VOICE OF THE FOREST

CONTINUED FROM 3103

If you look long enough at anything in Nature, you will find that it is a world packed with enchantment. Shakespeare says that a quiet life

> Finds tongues in trees, books in the
> running brooks,
> Sermons in stones, and good in everything.

A foolish fellow, hearing this quotation, exclaimed :

" Nonsense ! Books in brooks, sermons in stones ! Absurd ! What he meant was, Sermons in books, and stones in the running brooks."

Another poet, describing a stupid person, hit him off in these lines :

> A primrose by a river's brim
> A yellow primrose was to him,
> And it was nothing more.

To a person who does not look long enough, there are no books in the running brooks, no sermons in stones, and a primrose by a river's brim is a yellow primrose and nothing more.

An old woman, seeing one of Turner's beautiful pictures, said scoffingly :

" I never saw a sunset like that ! "

" No, ma'am," answered the painter, who was standing near, " and you never will."

Some people cannot see anything properly because they have not trained their eyes to see.

Look for a long time at a tree, and see what it will teach you. It is more than a tree. It is more than trunk and branch and leaf. It is a great poet, a great teacher, a great servant. Think for one moment of the silence of a great forest. You know what a tremendous noise comes from our factories and workshops and engine-sheds ; compare that stir and clamour with the abiding quiet of a forest. And yet the work of the forest is, perhaps, the most important work that is done on the earth, and is something which man cannot imitate even in the very smallest degree.

In silence, in perfect stillness, the beautiful leaves of a tree drink from the air, and sweeten the twig, the branch, the great trunk, and the spreading roots deep under the earth, with the invisible nourishment of the air.

This work is part of Nature's marvellous chemistry. The leaf takes from the air its richest food, and from the sun its most valuable property, and in silence changes them into things without which our life could not exist. The death of a leaf means bread for the table, fodder for the cattle, and perfume for the rose. The death of a tree means speed for the railway engine, heat for our houses, and light for our cities. The two supreme things in existence on the earth, fire and food, come from the leaf of a tree.

There are few sights in Nature more striking than the fall of the leaf in autumn. Look at this lovely wood, where we came in summer, and, resting on the mossy bank beneath oak and elm, held our picnic, listened to the song of the birds in the branches, and saw the shafts of sunlight glimmering through bright leaves. The mossy bank is soaking wet, the leaves have become red and brown and russet, a heavy scent breathes on the damp air, and as we stand listening, we hear on every side the steady, ceaseless fall of leaves.

THE FRESH LIFE THAT THE FALLING LEAVES CARRY TO THE EARTH

Dead leaves? No; they are still carrying on their beautiful work. Down from the branch, where they protected flowers from the scorching heat of the summer sun and hid from their enemies the happy housekeeping of birds and squirrels, down from the branch which they fed with life, these leaves fall with fresh life to the earth.

Look round the room where you sit. The chair in which you rest, the floor on which the chair stands, the frame of the window through which you see, the laths of the walls which keep you protected from the cold, the very paper on which you read what is now being written with the aid of a wooden penholder, all these things came from the tree that was once in the forest. And what is the origin of the tree?

An acorn—something that a new-born infant can hold in its tiny hand—may contain an oak-tree, and not only one oak-tree, but millions of oak-trees—enough to build a fleet of ships, a Spanish Armada, a city as large as Chicago. In every seed of a tree there is a forest. A little bird setting its exquisite claw on a tiny seed, and pressing it into damp earth, or letting fall one of these tiny seeds as it flies through the air, or shaking down one of these seeds as it perches on a twig, releases the spirit of life and brings a forest into existence.

THE WONDERFUL LIFE THAT IS CONCEALED WITHIN A TINY SEED

The seed of a tree is something quite small and insignificant. There are some of these seeds so small, and so exactly like the seed of many little plants, that even the microscope reveals no difference between them. But these little seeds, bursting in the darkness of the earth, and putting out tiny threads which push their way through the heavy soil, become in time gigantic trees, out of which man gets his wood for building, his manure for flowers, and his heat for furnace, railway engine, and factory.

Our bookshelf was, perhaps, a tiny seed which a robin, fed by St. Francis of Assisi, trod into the earth. Our chair was, perhaps, an acorn which, falling from its branch, struck the shoulder of Robin Hood. The pencil with which we draw horses and the little houses with smoke coming from every chimney is, perhaps, descended from one of the cedars which built King Solomon's temples.

The fire at which we scorch our faces when making toast was, perhaps, a tree under which Lincoln rested from the heat of the sun. There may be in our room, in our pocket, as there must be in many places all over the world, some manufactured article which once lay concealed in the tree on which our Saviour suffered death for mankind.

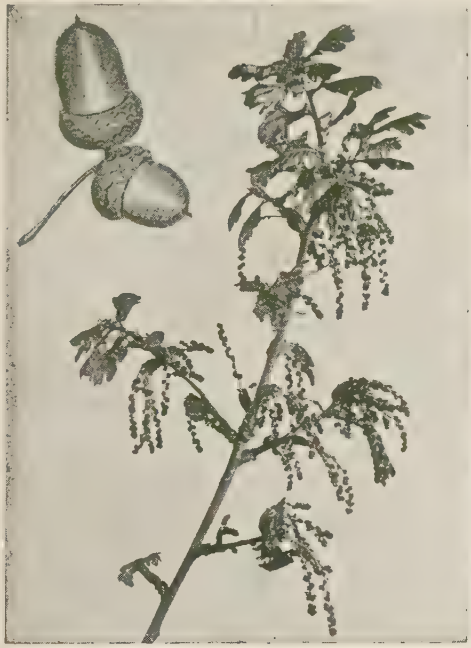
THE WONDER OF ETERNITY IN THE LITTLE GREEN TREE

There are tongues in trees if we have ears to hear. They tell us of Nature's magic provision, whereby, out of the invisible air and through the gorgeous gates of autumn, death passes for ever the gold and scarlet pageantry of life. A leaf does not die—it passes into fresh existence. The scent of the violet and the yellow of the primrose are the risen spirit of the leaf we call dead.

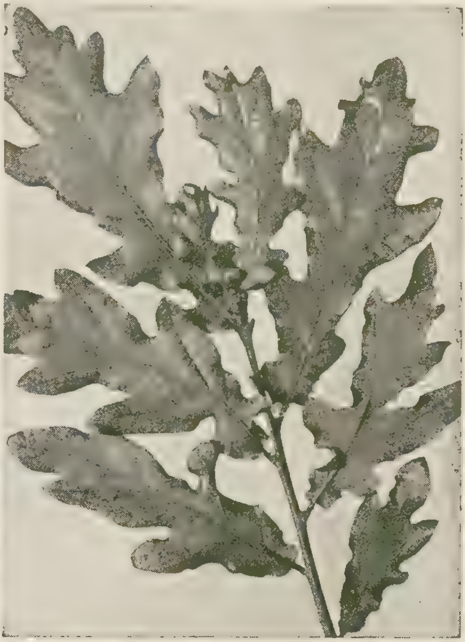
And the tongues of trees tell us of the history of the world. Not a little soot-grimed shrub in a Pittsburgh suburb garden but had its origin millions of years before ever a man opened his eyes on the earth. Man traces his ancestry into the past, gets back a few pitiful hundred years, and calls it his "family tree." The true family tree is every bush that grows, every little sapling that strikes roots into the earth and lifts its tender leaves to heaven. From eternity, that little green thing has come; it is a traveller that has been journeying millions of years longer than man, for it existed in the first seed, and through trees uncountable, thousands and tens of thousands, it has been making its way down to us who are living in this twentieth century.

FOR FURTHER TALKS ABOUT TREES SEE INDEX, AND FOR THE NEXT FAMILIAR THINGS SEE PAGE 3321

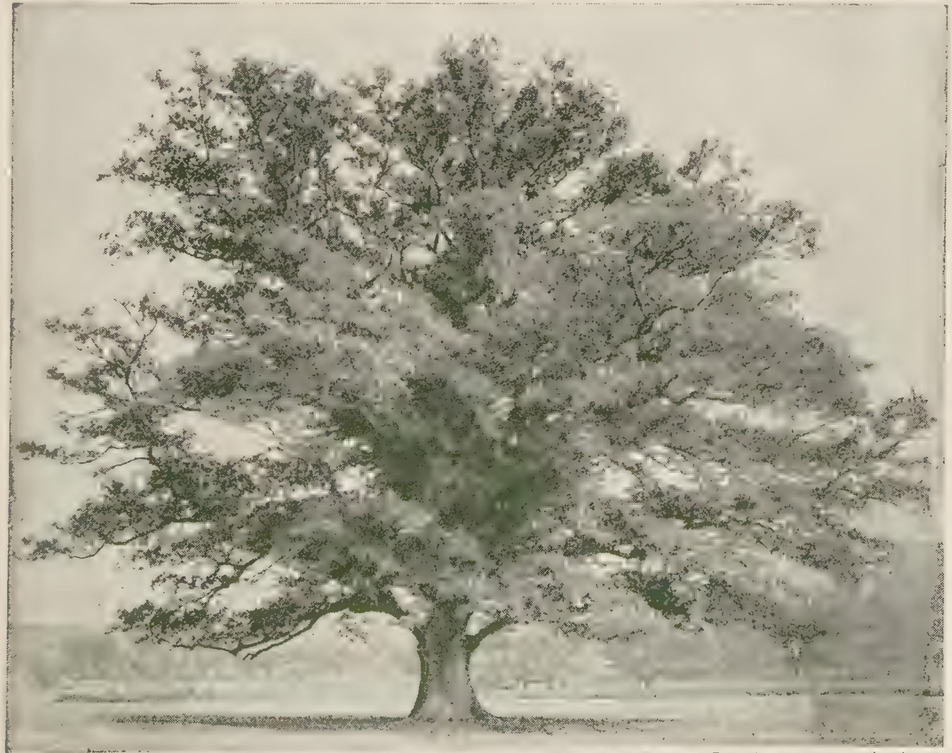
THE OAK, THE HERCULES OF THE FOREST



The green tassels we see on oak-trees are the male flowers, but it is from the smaller female flowers that acorns come. Our forefathers used to eat acorns.

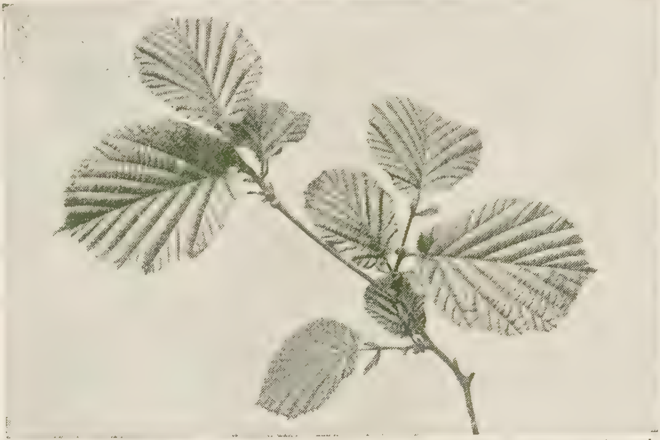


We all know the wavy leaves of the oak, which are more attacked by insects than those of any other tree. Over 1,500 different kinds of insects feed upon the oak.

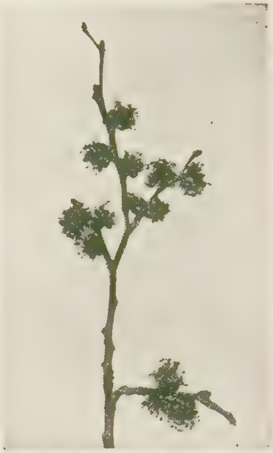


There are nearly 300 different kinds of oaks, and their leaves are all kinds of shapes. But the common oak, shown here, is the best known, and its title—"the Hercules of the forest"—is well merited, for it stands as firm as a rock. It lives 1,500 years, and the wood and bark of a single tree realise $100. Our warships used to be built of oak.

THE TALL AND STATELY ELM-TREE



The leaves of the elm are covered with little hairs, which get into our skin and sting like the nettle, though less severely. The elm is related to the nettle.



The elm flowers grow, not in catkins, but in little dark red tufts.

Even the oak is not a more typically English tree than the stately elm. At Horsham, in England, there is an elm which measures 61 feet round the trunk, and a dozen persons have sat down to a banquet in the hollow trunk. Many of the tallest and most stately elms in our Eastern cities are English.

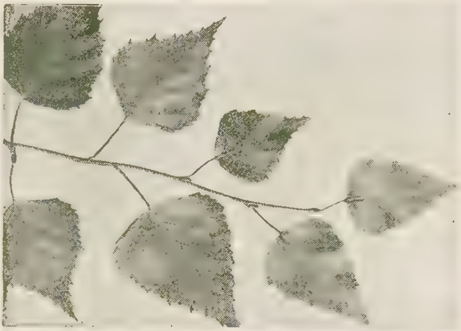
THE BEECH, THE MOTHER OF THE FOREST

The flowers of the beech are like little tassels on the ends of strings, and the fruit is used as food for pigs

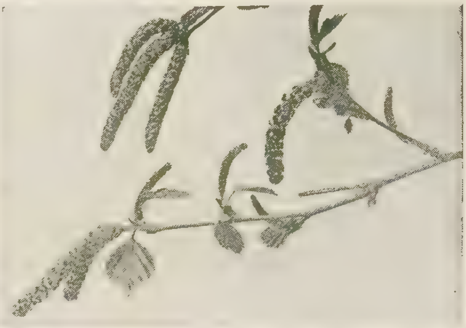
The beautiful beech leaves, that blaze like fire in the autumn sun, were formerly much used for stuffing beds.

Although the beech itself is of little use for timber, an expert has declared that without the beech we could not grow our most valuable timber trees, as the beech protects these from cold winds when they are young. From this fact the beech has been given the name of "the mother of the forest." If, however, a forest be planted with beeches and oaks, and left to itself, the beeches will, in course of time, crowd out and kill the oaks.

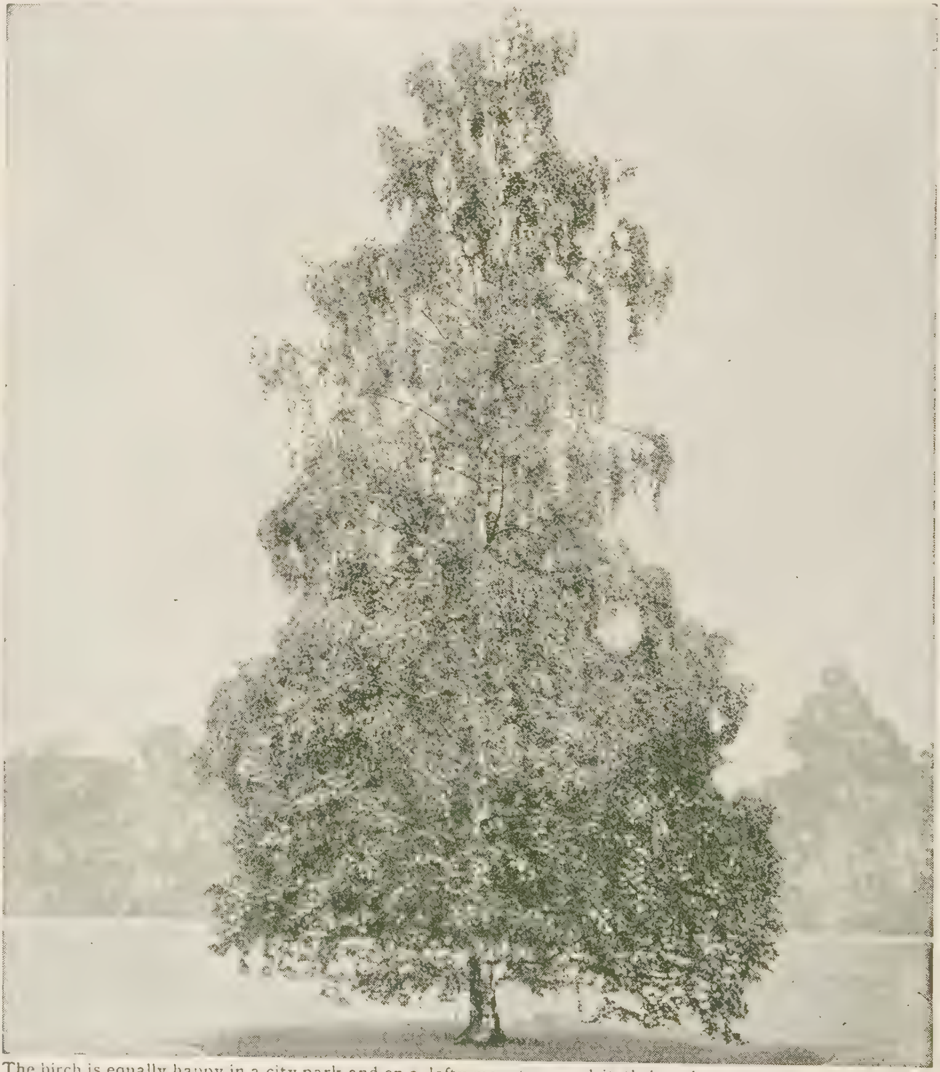
THE BIRCH, THE LADY OF THE WOODS



The birch is one of our most common forest trees. Its toothed leaves are small, and vary much in shape.

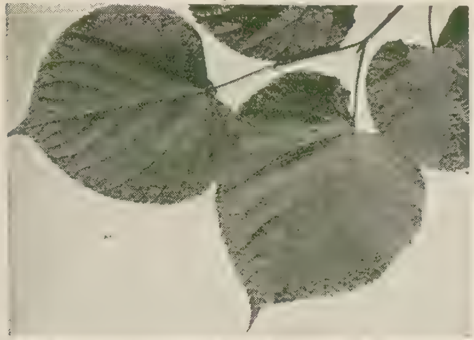


The flowers are in the form of hanging catkins, which are full grown in April, and are then dark crimson.

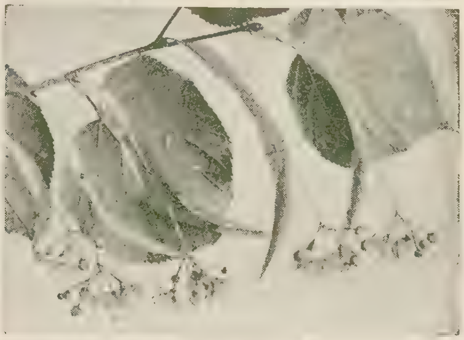


The birch is equally happy in a city park and on a lofty mountain, and it thrives in extreme heat or extreme cold. From its graceful appearance, it has been called "the lady of the woods." Every lad knows the use to which the twigs used to be put in British schools, where "birching" a boy still means whipping him.

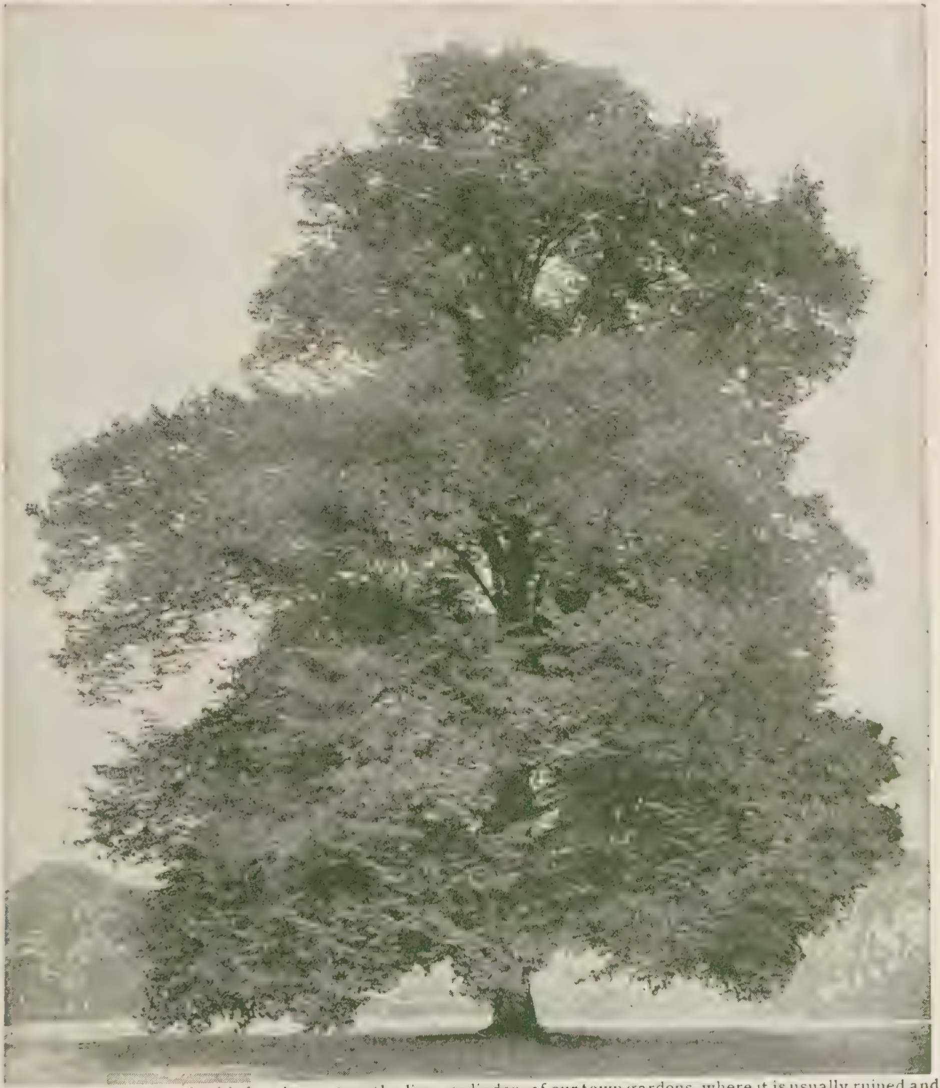
THE LIME, THE TREE OF THE HONEY-BEE



The heart-shaped leaves of the lime-tree are among the first leaves to fall in autumn Cattle are fond of them.

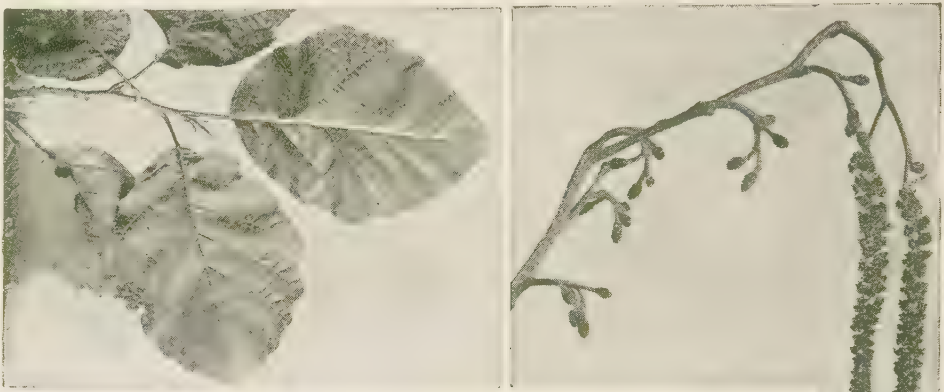


The flowers appear in clusters when the tree is covered with leaves, and swarms of bees visit them for honey.

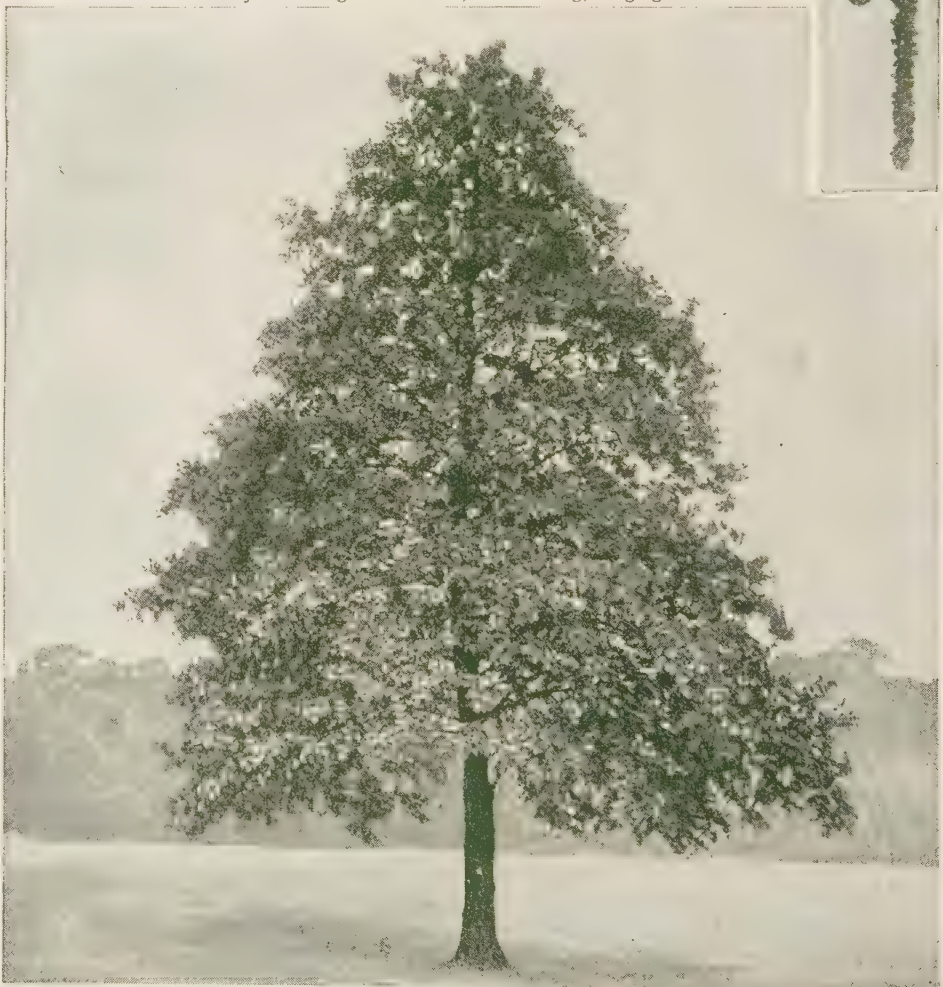


We scarcely recognise in this handsome tree the lime, or linden, of our town gardens, where it is usually ruined and dwarfed by constant cutting. But in a meadow or park the lime grows to be a fine tree, 80 or 90 feet high. Most of the historic carvings in old London churches are in lime wood. In olden times shields used to be made of lime wood.

THE ALDER, THE TREE OF THE RIVERSIDE

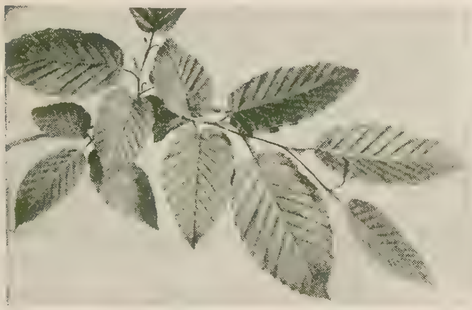


The leaves of the alder, which are rather sticky to the touch, remain fresh long atter the leaves o other trees have fallen. They are dark green in colour, and the long, hanging catkins are red.

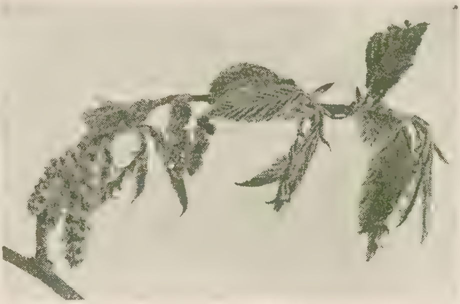


We see plenty of alder-trees growing near gunpowder factories, because the best charcoal for making gunpowder is obtained from alder wood. This wood is also very valuable for all purposes where timber is to remain under water, as in piers; and for this reason the French make their wooden shoes, called sabots, of alder. Alders flourish in moist places, such as the banks of a river. Dyed black, alder wood is an excellent imitation of ebony.

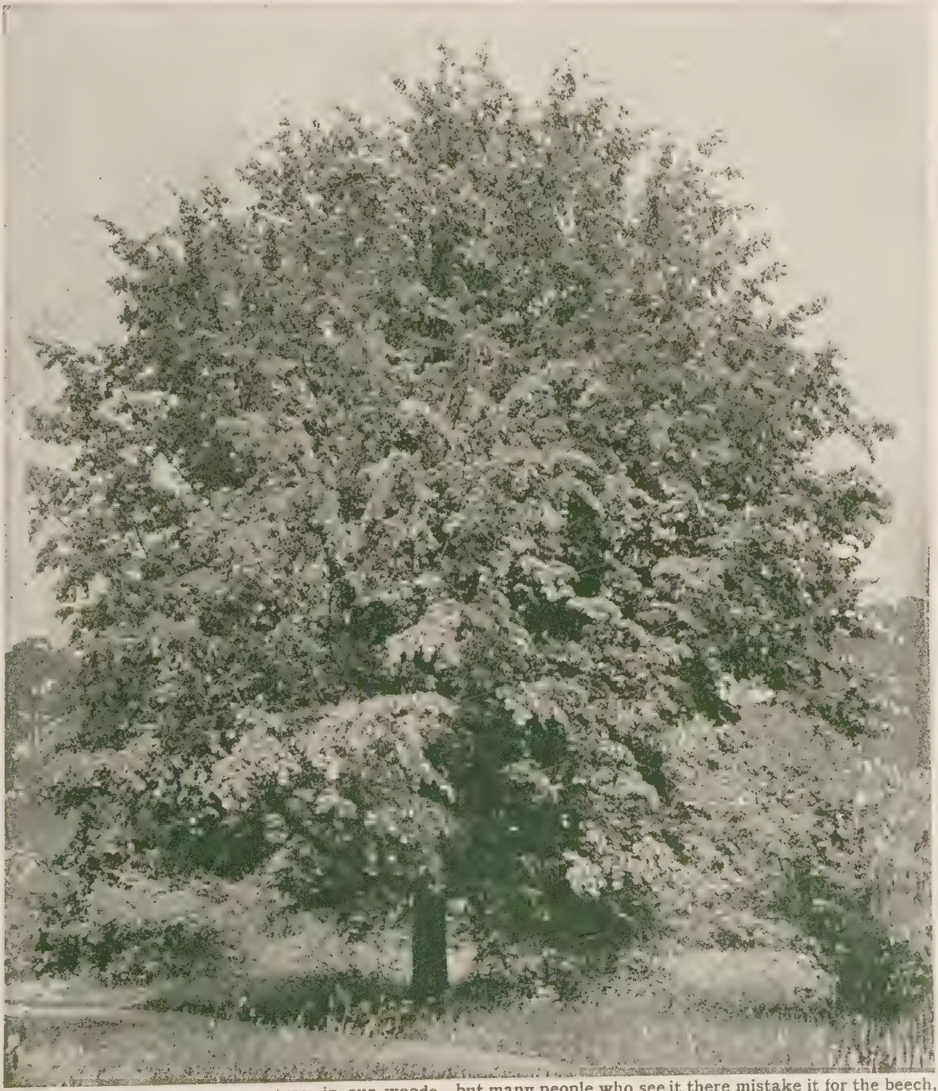
THE HARD HORNBEAM OF THE FOREST



The rough, toothed leaves of the hornbeam turn yellow in the autumn, then golden, and then a rusty red, remaining on the branches of the tree through the winter.

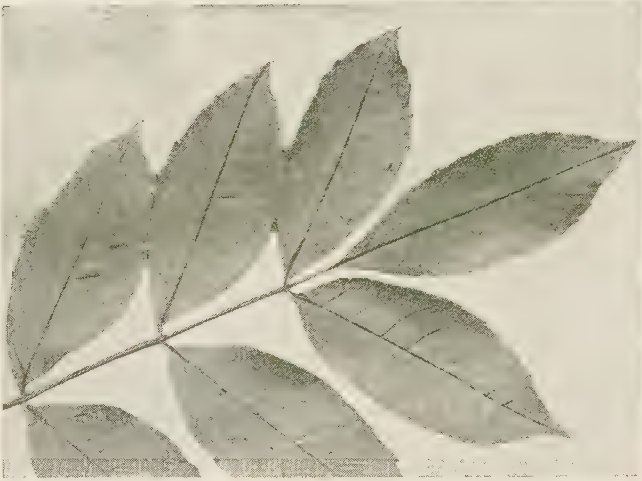


The male flowers of the hornbeam are always in the form of hanging catkins, as seen here, but the female flowers grow upright, and only droop when the fruit forms.

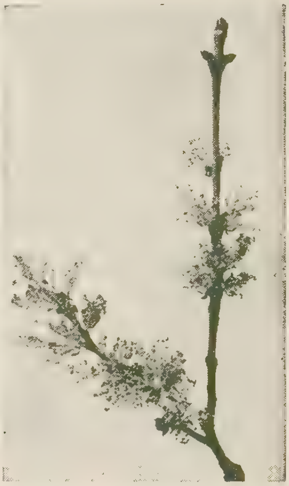


The hornbeam is a common tree in our woods, but many people who see it there mistake it for the beech, because of a certain resemblance in the outline. As a matter of fact, the leaves, the flowers, and the trunk are all quite different from those of the beech. Hornbeam gets its name from the horny toughness of the wood.

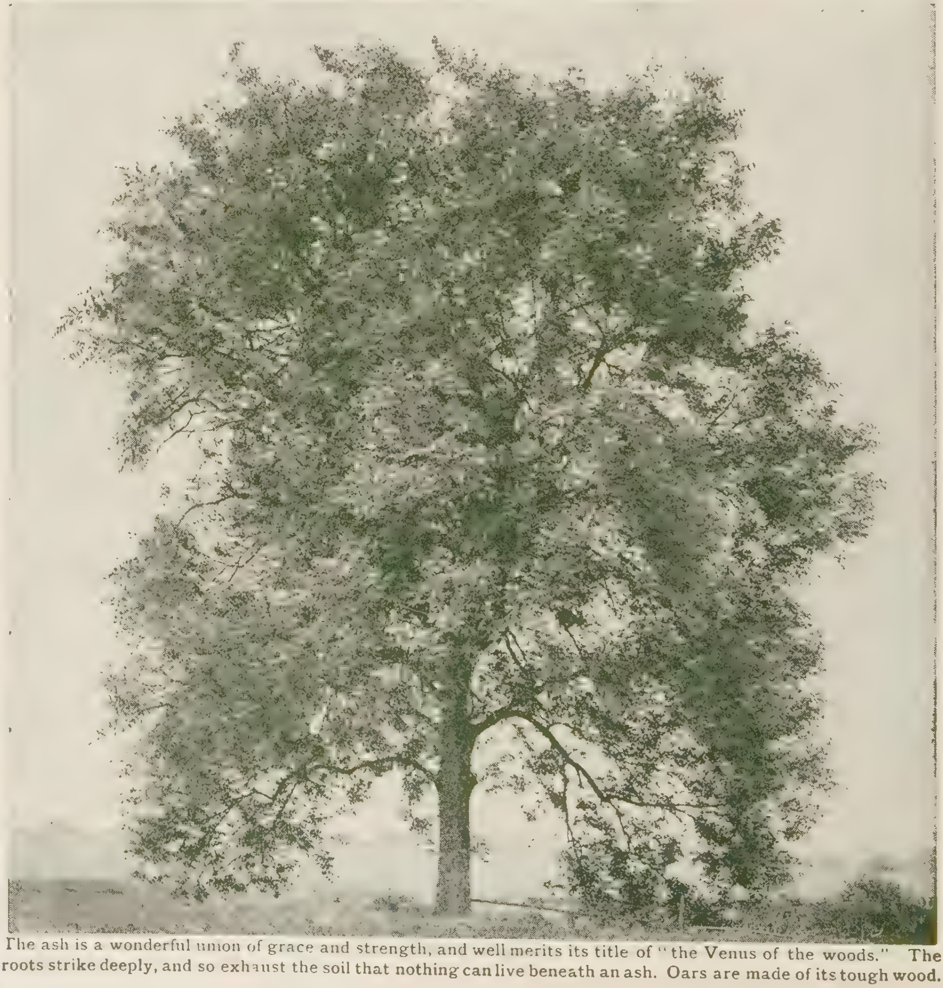
THE ASH, THE VENUS OF THE WOODS



Cattle and horses are fond of ash leaves, but it is said that when cows eat them their milk does not make good butter. The leaves come late and fall early.

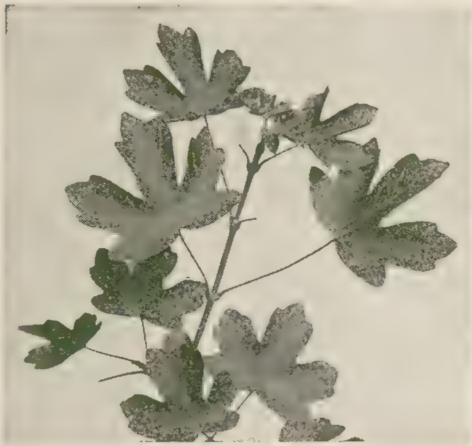


The flowers, which appear before the leaves, are very unattractive.

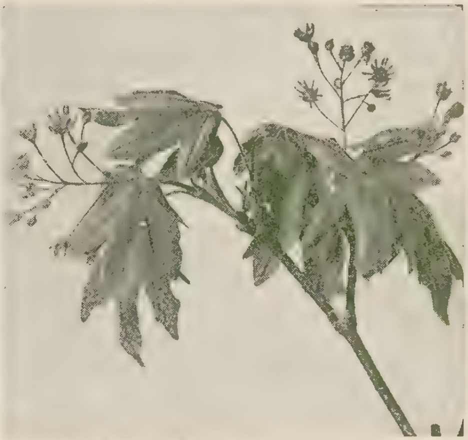


The ash is a wonderful union of grace and strength, and well merits its title of "the Venus of the woods." The roots strike deeply, and so exhaust the soil that nothing can live beneath an ash. Oars are made of its tough wood.

THE COMMON MAPLE OF THE HEDGEROW



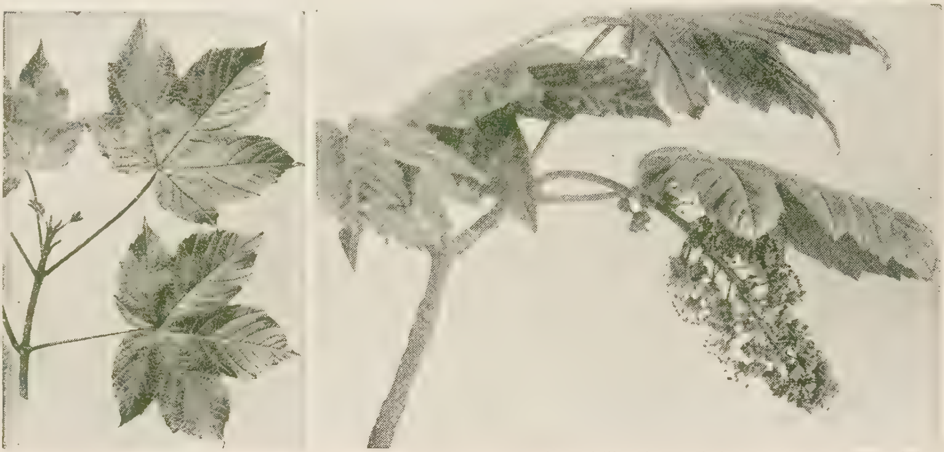
When Tennyson wrote of the common maple that it would "burn itself away," he was referring to the leaves, which change to a rich, blazing yellow in October.



The greenish yellow flowers are quite small, and develop into curious winged seeds, known to country people as "keys." These become crimson and brown as they ripen.

The beauty in form and foliage of the maples, their fine color in autumn, and their rapid growth, make them the favorite shade-tree for streets and lawns; besides this the sugar maple yields us the nutty brown sugar everybody loves, and the wood is excellent for furniture.

THE SYCAMORE OF THE SEA-COAST



The sycamore is called "the false plane," because its leaves are shaped like those of the plane. A sugary juice comes out of the leaves, and sugar is made from a tree related to the sycamore. The flowers are yellowish green.

The European sycamore is a fine-looking, robust kind of maple which will flourish even on an exposed sea-coast, where the gales and salt air kill all other trees. The tree mentioned under this name in the Bible is really a fig-tree, and the tree we, in the United States, usually call the sycamore is the plane-tree or buttonwood.

THE POPLAR THAT GROWS LIKE A GIANT

A Lombardy poplar, well covered with leaves, is a fine sight, as it sways in the breeze like an ostrich plume.

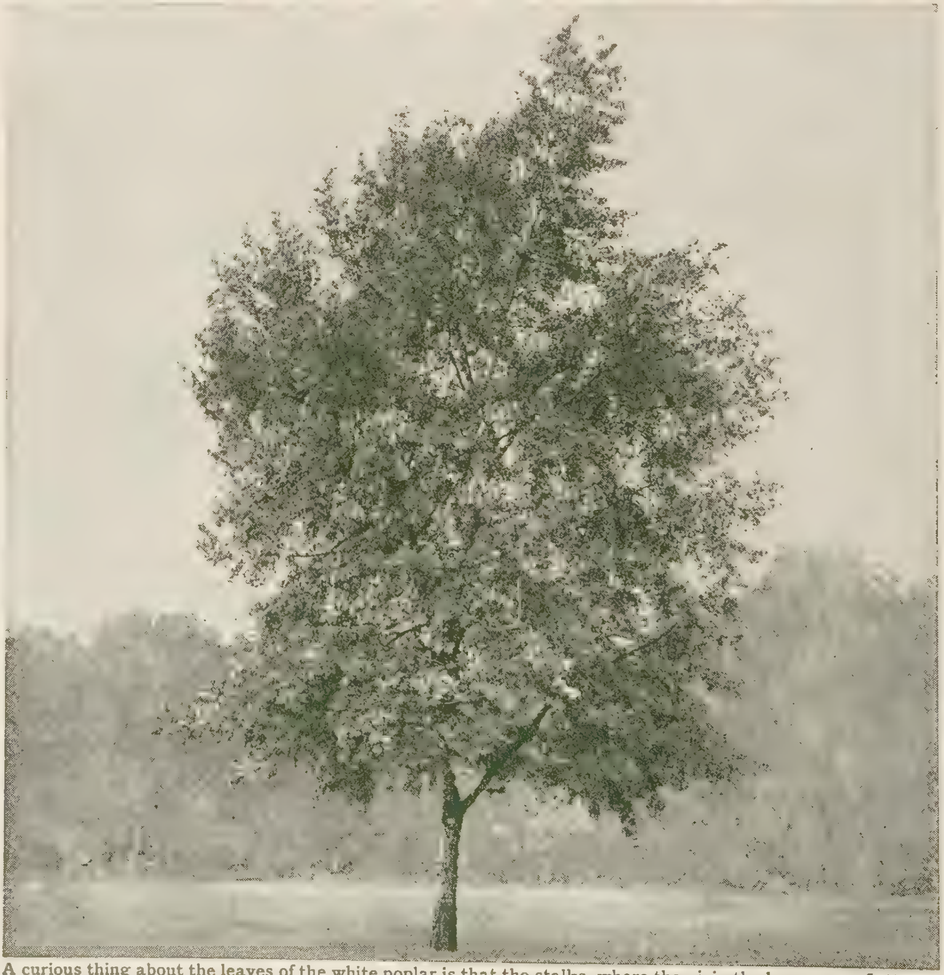
The flowers are in the form of drooping catkins, but these produce no seeds. Only male flowers grow in this country.

Although the Lombardy poplar was introduced into Western Europe and thence brought to America from Lombardy, in Italy, and so received its name, it is really a native of the Himalaya Mountains in India. It grows very rapidly, and a man who plants a cutting may live to see it become 125 feet high in 50 years.

THE WHITE POPLAR WITH SILVERY LEAVES

The handsome purple catkins of the white poplar grow several inches long.

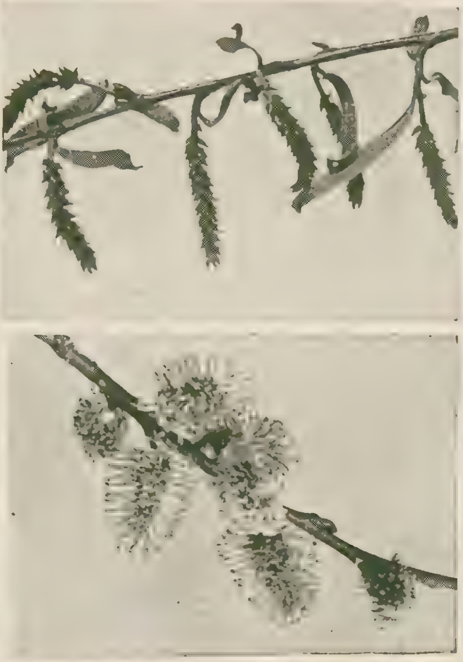
The dark green leaves are very light on the under-side, owing to a kind of down that covers them and makes the tree look silvery white at a distance.



A curious thing about the leaves of the white poplar is that the stalks, where they join the leaves, are flattened at the sides instead of top and bottom, and when the wind catches the tree it blows the leaves from side to side, instead of up and down, as is the case with other trees. The wood of the white poplar does not burn easily.

THE SAD AND SORROWFUL WILLOW-TREE

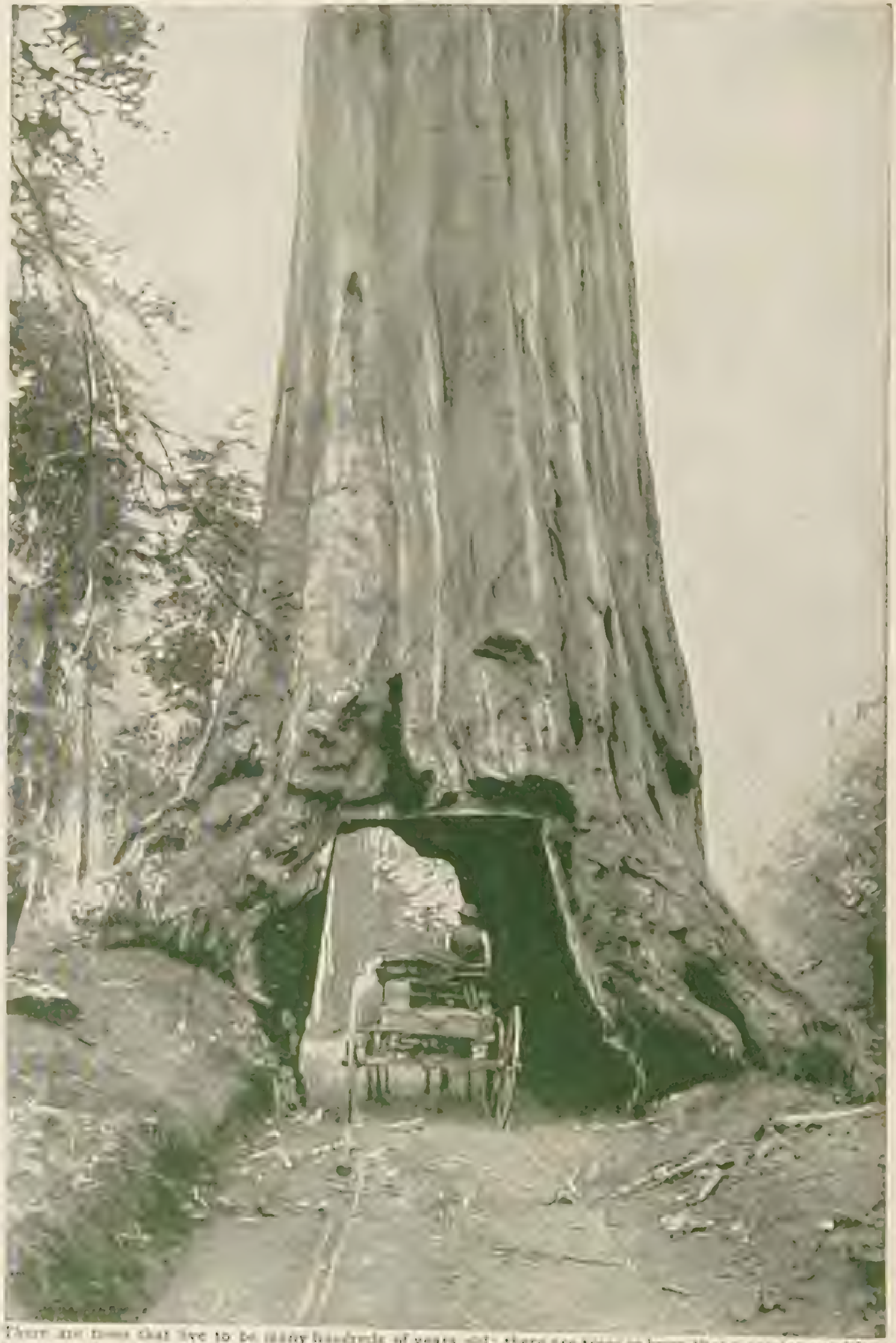
The leaves of the common white willow, like those of most of its relations, are long and lance-shaped.



At the top are flowers of the white willow; below is the sallow, or goat-willow, picked for palm at Easter.

A great botanist has called the willows the "troublesome family," because the different kinds are so difficult to distinguish from one another. But most of them, like the white willow, shown here, are graceful trees. They have, for some reason, become associated with sadness, and one of the family is called the "weeping willow."

A ROADWAY CUT THROUGH A TREE



There are trees that live to be many hundreds of years old; there are trees so huge that a carriage and four horses can drive through them. This is one of them. It is one of the largest trees on the face of the earth, standing in Mariposa Grove, California. It is called the Wawona Tree, and is so enormous that, as this picture shows, a road has been cut through it, and a horse and cart can pass through it with plenty of room to spare. The tree is 28 feet across.

THE NEXT FAMILIAR THINGS ARE ON PAGE 3371

WHAT THIS STORY TELLS US

CHILDREN are considered much more important now than a hundred years ago. This story tells some of the things which one great city is doing to help its children to become strong men and women. The schools are of course important, but we shall see that many things besides instruction are offered to our children; for it is of little use to teach a child who will grow up into a hopeless invalid. Besides the schools, the libraries are one of the most important means of education in the city. The little immigrant children are more eager to get an education than those whose parents were born in the United States.

WHAT NEW YORK CITY DOES FOR ITS CHILDREN

IN our Wonder Book, on page 2873 someone asks the question, "Will children rule the world?" and the Wise Man tells us why it is that the children mean so much to the welfare of a nation. They are the men and women of the future. People did not always think of this. In the days of which we read in our "Little Girls of Long Ago" it was believed that children's wills must be broken, their minds and bodies completely subjected to their parents. A child was merely an unregenerate little being who "must be seen and not heard." Though as dearly loved by his parents as the child of to-day, his welfare was left in their hands and it never even occurred to the community to consider him in making its plans, with the exception of the provision for schools, of course.

THE NEW VIEW OF THE IMPORTANCE OF THE CHILD

To-day the world is awakening to the supreme importance of the child. It is beginning to realise that in the hands of the children will some day rest the government of our nations and the making of our homes, and that if we wish the United States to continue a strong and mighty republic, we must carefully look after the training of our children. New York, Boston, Chicago and many other of our large cities have found that if they would have healthy-minded, wholesome-bodied citizens they must see that the minds and bodies of their little ones are properly cared for — that the children are properly fed, and clothed, properly housed and properly taught, or else the well-being of the child and of the community will suffer. The parents in many cases are too ignorant or too poor to do these things for their children.

New York City, with its ever-changing, ever-growing population of immigrant children, has a particularly hard problem to face, and in many ways its government has responded nobly to the crying need for child training.

WHAT THE PUBLIC SCHOOL DOES FOR THE CHILDREN

It has a system of public schools, which, though perhaps not all that it should be, still accomplishes wonders with the children with whom it has to deal. It takes many of them from dirty, crowded, poverty-stricken tenements of the city — Italian, Russian, Polish, Hungarian, — and undertakes to lay a firm foundation for good citizenship and good home making. The children enter the school with no knowledge of English, accustomed to the squalor and filth of the tenements. In a few years they leave the school, but with what a difference! They have been trained in personal cleanliness, and many have responded to the training; they have learned the language and have a fair knowledge of the land in which they live — and they are proud of their knowledge, proud of

Copyright, 1911, by M. Perry Mills.

their school, proud of their teachers, and above all proud of the great United States — the country of their adoption.

THINGS STUDIED IN THE SCHOOLS

The public schools of New York try to cover the field of a child's development into citizenship as widely as possible. Besides the subjects usually taught in schools, they provide classes in carpentering for the boys, and cooking classes where the girls learn the real value of simple foods and how to prepare them; they have calisthenic exercises and gymnasiums to make the children's bodies strong and healthy; they have school doctors to inspect the eyes, teeth, noses, and throats of the pupils, and to see that all defective children are properly cared for; and they have nurses to visit the homes of children suffering from illness, and to instruct the parents how to care for the little patients intelligently.

In other ways, too, the public school is doing a fine work. The children of the tenements must begin to earn their living at a very early age. The general intelligence and penmanship of a public school trained child help it to get a start, from which it may rise to success. For ambitious boys and girls there is further training. The great public high schools enroll thousands, and at the top of these are two great colleges, one for boys and the other for girls, where tuition and books are free. Where the child must work there are night schools, where the children may carry on the subjects of the high schools and where stenography, typewriting, bookkeeping and sewing are taught.

PARENTS' ASSOCIATIONS

The public school does not rest content with dealing with the child in the class-room alone — it tries to reach him through his home, and for this purpose it has organised mothers' meetings and parents' associations. At these meetings the parents and teachers talk over the children, and discuss the best methods for bringing them up. The parents' obligation to send the child to school clean is tactfully pointed out. And gradually the parents learn the danger of disease that lurks in uncleanliness. Among other things the harm of promiscuous theatre-going and the damage brought about by cigarettes is brought to the notice of the parents. The mothers are asked to co-operate with the school doctor. Perhaps a trained nurse gives a series of demonstrated talks upon "The Proper Care of Children's Diseases;" and so, bit by bit, the parents come to realise somewhat of their responsibility to their little ones, and the children are immeasurably benefited.

THE LITTLE MOTHER'S LEAGUE

But the grown-up mothers are not the only means by which the little ones are reached. An association has been formed of the older sisters who often have the entire care of the babies, called "The Little Mother's League" and in most cases these "little mothers" are found to be much more amenable to advice than the mothers themselves. One afternoon a week during the summer, the girls of the tenements who are forced to take the younger brothers and sisters, meet in various schoolhouses, where for an hour or more they are given practical talks by doctors and nurses connected with the health department.

"The various prepared baby foods are discussed, and under skilful direction of the nurse the little mothers are allowed to prepare modified milk and to sterilise the bottle. Then one of the babies will be given a model bath; another will have its tiny clothes pinned and adjusted so that it is made as comfortable as possible. After the nurse has shown how these things should be done, the little mothers demonstrate how well they have learned their lesson.

"Emphasis is laid, in all the talks, upon what plenty of fresh air means to the baby, and upon the need of having it in clean surroundings. The little mothers are asked to tell from week to week how their babies have been, and these experience meetings are of the keenest interest."

FROM ELLIS ISLAND TO CITIZENSHIP

From the poor, timid little strangers entering the country through Ellis Island, to these rugged little Americans working away at their garden plots, is quite a step. This is one of the garden blocks in the upper part of New York City, where the children, under trained instructors, learn gardening.

The little immigrant children landing at Ellis Island, the gateway to New York, have their Christmas tree like any other little Americans. Here we see a group of little Italian youngsters proudly displaying the gifts that Santa Claus, in the form of a United States official, has brought them.

HOW TO TAKE CARE OF A BABY

That these talks are earnestly devoured and digested by the little mothers was proven by the brief essays they were required to write not very long ago, at the close of a series of lectures.

One little mother wrote thus: —

"Do not dress the baby warm in summer. Put very little clothes on it. The best food for the baby is barley water. When it is sick give it a dose of castor oil. You must nurse the baby according to how old it is. Bathe the baby every day. Sponge it every minute. Do not give it any fruit or grocery milk. Do not give it any apples, or pickles, or watermelon, or any of that kind of stuff, because the baby will die."

Each girl belonging to "The Little Mother's League" wears a badge as a token of membership; and the president of each group wears a gilt badge which is looked upon as a mark of high honour. These little mothers are in most cases from six to fourteen years old, and in most cases have to care for the baby during the day, while the mother is away at work. The elder sisters too are one of the best means of reaching the mothers themselves, who are not always as adaptable as could be wished and often flatly refuse to follow the instructions of the visiting nurses connected with the public schools and the city hospitals.

VISITING NURSES AND PHYSICIANS

The city hospitals, and as we have said before, many of the public schools in New York City, have physicians and visiting nurses connected with them, and it is astonishing the downright ignorance and suspicion with which they are met in their efforts to bring the mothers to a proper realisation of their responsibility.

One nurse of wide experience in this work said that while many of the mothers were glad to take whatever assistance might be offered to them, she found it a very difficult, almost impossible, task to make them realise the necessity of cleanliness and of proper regard for food. She cited a case of one family where the child, during one day, had been fed on watermelon, potatoes, pickles, and practically everything else at hand except the milk which should have been its sole diet. In another case the nurse found the baby, a few weeks old, lying in a basket by the side of the stove sucking a piece of cornbeef. "Why did you give the baby cornbeef?" asked the nurse patiently, as she gently unclasped the baby hands from the indigestible morsel.

"Well, and what would you have me give him?" returned the mother crossly. "He don't like pork."

The nurse stated that in some cases the only hope for a sick child's life lay in taking it away, temporarily, from its improper surroundings.

SEA BREEZE

For such poor, little, sick waifs of the city as these, homes like the Sea Breeze Tuberculosis Hospital and the Home for Sick Babies at New Dorp have been founded.

The Sea Breeze home is built upon Coney Island and contains many of the little ones who have been seized with that terrible scourge of ill-nourished childhood, bone tuberculosis. Here hundreds of little cripples from the tenements of New York City, whose lives would be otherwise hopeless, are given a chance in the open on the seashore, summer and winter alike, until the healing forces of nature have done their work.

Mr. Jacob A. Riis introduces us to one or two of the brave little inmates of Sea Breeze in person.

"Here is five year old Max Gross," he writes, "child of poverty and want, all the days of a long and weary year strapped to a frame that holds his little body rigid because his back is not like the other children's. Yet ever cheerful, never hopeless, calling across the room to the doctor, 'I am all better!' Poor little chap! Once and only once, his tears fell; and when his nurse went to him in alarm he sobbed out upon her sleeve that someone had said on the porch as he was carried by, 'Max will not get better.' 'And I don't want to get dead and be an angel,' was the cry that wrung the nurse's heart, 'I want to get off my board and play first!'

FRESH AIR AND FUN FOR THE CHILDREN

Here is a picture of a corner in one of the many roof playgrounds in New York. These roof playgrounds, far above the hurly-burly of the city streets, provide happy, healthful places of amusement for the little children of the slums.

Fresh air is the most essential thing in the world for a sick child, and the floating hospitals, the ferry-boat schools and the seaside homes that New York City and its charitable organisations provide for its suffering little ones, bring health and rosy cheeks to many who would otherwise die.

New York has one of the best organised systems of public playgrounds in the world. Here we see a group of lads under the care of two of the city game teachers Base-ball, basket-ball, tennis, and golf are among the games taught the boys.

"Then here is Madeline Garland, Max's bosom friend. She is seven and her Sea Breeze name is Bumps, supposedly from the big freckles that cover her jolly little face and snub nose. Like Max, she has all her days been strapped to the board that looks so cruel and is so kind, and views the world about her brimming over with joy, her nurse says. Sea Breeze is all the home she has ever known."

All the days are spent in the open at Sea Breeze — even the school is a tent, and very cold weather only shortens the brief school hour.

THE HEALING CAMP ON THE ROOF

But all the little consumptive children of the slums cannot be taken into the seaside homes, so roof camps have been established where the children can spend the days in the open air. The patients arrive at the camp each morning at nine o'clock and are at once given to drink a glass of fresh milk with a raw egg beaten into it. Then the children have their lessons almost as they do at school. At noon a plain, wholesome dinner is served, and in the afternoon another glass of milk with a raw egg is given. Promptly at five o'clock the camp closes, but the unhealthy conditions of the home are not allowed to neutralise the good effects of the open air. "Nurses and physicians visit the tenements and see that the lightest, airiest room is given to the patient. They see that the linen and eating utensils of the patient are washed separately and give tickets for two quarts of fresh milk and three raw eggs a day. The day camp is one of the many wise agencies provided by New York City in the struggle against the great White Plague."

PLAYGROUNDS IN THE AIR

But after all it has been found that the real hope of the city lies in the healthy children, and the government has set itself to the task of keeping them robust and happy, and providing them with wholesome employment for their brains and bodies. For this purpose it has established open air playgrounds, roof gardens, recreation piers, bathing pools, garden plots, and athletic grounds and has secured jolly, wholesome young women and men to teach the children how to play.

The settlement workers among the children of the slums count the roof gardens as one of their most valuable helps. All the newer public school buildings in New York are built with roof playgrounds, enclosed with wire netting and floored with tile. Here the children learn baseball and basketball and even tennis, and perhaps in the evening there are gymnasium classes and dancing classes.

Many of the model tenements are built with roof gardens, and many of the Day Nurseries of New York City have summer roof gardens, where the little tots left in the care of the nurses can play in the open air until that best of medicines begins to bring back the pink glow of health to their pale cheeks. On the roof gardens the children find swings and hammocks and shoot the chutes, and flowering plants for whose growth and care they are sometimes made responsible.

THE PUBLIC PLAYGROUNDS

Then there are the playgrounds where a fellow can play ball just as much as he likes without being taken up by the "cop," where there are swings and rings and bars and trapezes and tennis courts and sand piles, and other delights innumerable. From the oldest boy to the littlest of the little folk there is something for all to do — and all this away from the dust and clamor of the heated city streets.

The value of the public parks as playgrounds has also been recognised, and once in a while, New York takes the little girls from the public schools and trains them for a public exhibition of folk-dancing in the parks. What fun the children do have over the dances, and how their little stranger hearts begin to glow with an understanding and pride in their new country! The children have come over the seas from Russia, from Ireland, from Germany, from Poland, from Italy, and everything is so different, when lo and behold, in the big public school building they find a teacher who teaches them the dances that they have seen danced in their own country. So far as possible each child is taught the dances of its own nationality -- the folk-dances of Germany, Scotland, Ireland, Spain, Russia, Italy, Poland, Bohemia, Sweden or Hungary.

The public parks, too, are often the scenes of games by boys and girls in flag drills and other forms of patriotic plays. So the old is linked with the new and the little foreigners at last begin to feel that they are really American citizens.

RECREATION PIERS

Dancing is taught also at the recreation piers, which have been built at various spots along the Hudson and the East Rivers as breathing spaces during the summer for the children living in the hot crowded tenement districts of the big city. These piers are open from May to September and there is a concert on each pier every evening from eight to ten.

PUBLIC BATHS AND SWIMMING POOLS

For the hot dog-days the city, moreover, provides an elaborate system of free baths and swimming pools for its boys and girls, where they can swim and splash about in the cooling water to their hearts' content. Teachers are provided to give the children lessons in swimming and diving and other water sports, and the children in their play learn the real value of cleanliness.

THE LIBRARY'S PART IN MAKING AMERICANS

Thus New York City builds up and trains sound bodies for its boys and girls, and what does it do for their minds? We have spoken of the training of the public schools with their classes in domestic science and the trades. The public library takes up the task of training where the public schools leave off. All of the New York libraries have children's reading rooms and tables and wee chairs for the little ones. Many of them have a weekly story hour when a trained story teller tells well-beloved tales to the children. These story hours are usually separated into two divisions — fairy stories for the wee tots and hero tales for the older boys and girls. Often only some exciting bits of a story are related and the story teller stops short with these words: "And the rest of the story can be found in the books on the library shelves." And so a taste for the best reading is cultivated in the children.

Patriotic stories are in particular demand, and the "Washington books" and the "Lincoln books" are positively worn to shreds in the libraries of the lower East Side, by the little foreigners who are eager to learn of the brave men of their new adopted country.

But eager though the child may be to receive reading matter, there is a hard and fast rule that no books may be taken out by little people unless their hands be clean.

"Three minutes after school is dismissed in the afternoon the line begins before the library desk. Ten minutes, and it reaches across the room. Fifteen minutes and it is down the stairway to the door and into the streets. The longest line on record is accorded the Seward Park library branch, where fifteen hundred children with eager faces have been counted draping the stairway and winding around the building and three blocks about the square, all patiently waiting 'to give themselves in to take libraries.'"

When the hands are pronounced satisfactory the children pass into the reading room. Boys and girls just "joining" the library are asked to sign a pledge which reads as follows: "When I write my name in this book, I promise to take good care of the books I use and to obey the rules."

Upon being asked what that means one little girl showed she had a thorough understanding of the matter.

"It means to wash your hands always before you read a book, and not to let my baby tear it."

And so the lesson of cleanliness and the delights of fairy land go hand in hand. It is said that in New York City more than one third of its seven million library books circulate among the children.

AMERICAN HEROES OF SCIENCE

WHEN Cuba came under American rule, she was cursed with a greater enemy to mankind than any foe our country everfaced on the battlefield. Yellow fever, that most dreaded of tropic diseases, had slain its thousands and ten thousands. Its history is one of destruction and death in the West Indies, on and along our southern coasts and in many ports where ships hail from the tropics. Havana, the great shipping centre for Cuba, seems to have fared worse than any other place. For centuries it has been a helpless victim in the face of one outbreak of the fever after another.

THE MYSTERY OF YELLOW FEVER

No one knew how the disease came or in what way it was carried from one person to another. Many thought that in some mysterious way it was carried in the air; others believed it was spread by touching clothing, bedding or any article that had been on or about a yellow fever patient; again, there was a very general belief that the disease came entirely from filth and uncleanliness. So, when Cuba came under our protection and Havana's troubles became our troubles, our first thought was to help in any way we could to save the city from its old enemy, yellow fever. It was planned, first of all, to clean the city up. This was done and there were hopes that the fever would not appear again. But in spite of the care, the disease broke out again and raged worse in the very parts of the city thought to be the most sanitary.

THE MOSQUITO THEORY

It was clear that the cause of the fever and the source of the infection were still a mystery. Something else must be tried. It was at about this time that Dr. Carlos Finley's " mosquito theory " began to attract attention. As a Havana physician, he had said, more than twenty years before, that he believed this fever was carried from one person to another by a certain kind of mosquito. No one believed him at first. But he kept on talking about it and writing about it and made some experiments himself. In the end the people became interested in the mosquito theory and were willing to make great sacrifices to find out what truth there was in it. The story of this search is the story of the heroic work done by the United States Yellow Fever Commission in Cuba during the summer and fall of 1900.

THE MEN WHO TRIED TO FIND THE TRUTH

The commission was made up of four physicians, all well known in the world of medicine. Major Walter Reed, surgeon in the United States army, was in charge, and with him were contract surgeons, Dr. James Carroll, Dr. Jesse W. Lazear and Dr. Aristides Agramonte.

Quemado, Cuba, was chosen as the field for their experiments. Here they arrived on June the twenty-fifth, and work in the yellow fever hospitals and laboratories began at once. Never did four men go out more certainly and battle with death. Their self-sacrifice and courage equal the bravery of any soldier on the battlefield.

As no animal ever takes the disease, all the experiments had to be made upon human beings who had never had the fever. They had to submit themselves to the bites of mosquitoes known to have bitten yellow fever patients. The mosquito Dr. Finley suspected as the cause of all the trouble is known as the stegomyia fasciata. Experiments were begun at once with this kind of mosquito. Dr. Carroll allowed himself to be bitten by one he knew to be infected. In a few days he developed yellow fever, but fortunately got well.

Copyright, 1911, by M. Perry Mills.

Dr. Lazear was bitten twice. There were no results from the first biting. The second, however, proved fatal. Five days after the infected mosquito bit him, it was known that he had taken the disease, and, after a week's illness, he died. His death was felt to be a great loss indeed. He was a young man of great ability and well trained to do just the work he had in hand.

Work was begun again in November. It was decided to have an experimental station one mile away from Quemado and carry the work on there. In honour of their co-worker they named it Camp Lazear. Two houses were built on the chosen site, one was called the infected-mosquito house and the other the infected-clothing house. In these two houses experiments were to be carried on. The infected-mosquito house was divided into two rooms separated from each other by a wire screen. Everything about the house was carefully disinfected. In one room were to be placed mosquitoes that were known to have fed on the blood of yellow fever patients. The other room was to be kept free from the insect. The wire screen prevented any mosquito going from one room to the other. The plan was to put men who had never had the disease in each room and await results. Volunteers were called for. There was a quick response. John Moran and Jim Kessinger, a young Ohio soldier, offered to go into the room with the infected mosquitoes.

These two soldiers lived in the room with the deadly mosquitoes and allowed themselves to be bitten by them a number of times and in a few days developed the fever. The men who lived in the room where there were no mosquitoes showed no signs, whatever, of the disease.

WHAT THESE EXPERIMENTS PROVED

The infected-clothing house was small. It was built to let in the least amount of air needed for life, in short everything about it was most unsanitary. The plan here was to fill the place with clothing and linen taken from yellow fever patients, then to have people live in this atmosphere for several weeks. Volunteers were again called for, and the offers again came quickly. Dr. Cook with two privates entered the house. They unpacked tightly covered boxes containing soiled pillow-cases, blankets, and clothing from patients in the yellow fever hospital. They handled the clothes thoroughly, shook them out to scatter the germs, if they contained any, and hung the articles around the room. In the midst of this they lived twenty days. Not one of the men showed any signs of the disease when the quarantine was lifted.

Untiring work in investigating went on for months. Experiments were made under more and more trying conditions. Men wore clothing of yellow fever patients for days, they slept in infected bedclothes, they allowed themselves to be bitten by mosquitoes that had fed for days upon yellow fever patients, they exposed themselves in every possible way to the attacks of this disease.

All this sacrifice, to give one great truth to science. We know now, beyond doubt, that the mosquito, stegomyia fasciata, is the tiny man-slayer. We know too that it is the only agency by which the disease is carried from one person to the other. There is no danger from the dreaded fever so long as one has not been bitten by this kind of mosquito.

As soon as these facts were made known those in charge at Havana set to work to kill off the deadly mosquito. There have been small outbreaks from time to time and the disease has appeared along the southern coast; but it has been stamped out and it isn't likely that these places will ever have another terrible scourge. Each appearance of the disease will cause less and less general fear or danger. Dr. Carroll, as you know, took the fever and barely escaped with his life. Dr. Lazear and some of the volunteers died. Dr. Reed braved the perils of his companions and was the inspiring genius of the investigation. Though he escaped with his own life, his health was so broken that he did not recover from a fever contracted during the following year — but his campaign against yellow fever was a victory. His name should be a household word.

THE LITTLE GREY BIRD IN THE BRANCHES

They went together to the wood where the nightingale used to sing, and half the Court went with them. On and on they went till they reached the wood, and the little girl stopped before a tree. "There she is!" said she "Listen, listen! There she sits!" And she pointed to a little grey bird up in the branches.

THE EMPEROR'S NIGHTINGALE

CONTINUED FROM 3160

The palace of the Emperor of China was the most magnificent in the world. It was made entirely of fine porcelain, exceeding costly, but at the same time so brittle that it was dangerous even to touch it. The emperor's garden extended so far that even the gardener did not know the end of it.

Whoever walked beyond it, however, came to a beautiful wood with very high trees, and beyond that to a lake. The wood went down quite to the lake, which was very deep and blue; and among the branches dwelt a nightingale, who sang so sweetly that even the poor fisherman, who had so much else to do when he came out at night-time to cast his nets, would stand still and listen to her song.

Travellers came from all parts of the world to the emperor's city; and they admired the city, the palace, and the garden; but if they heard the nightingale, they said: "This is best of all." And they talked about her after they went home, and learned men wrote most beautiful verses about the nightingale of the wood near the lake.

These books went round the world, and one of them at last reached the emperor.

"What in the world is this?" said he. "The nightingale! I do not know it! Can there be such a bird in my garden without my having heard of it?"

So he called his gentleman usher. Now this was so grand a personage that no one of inferior rank might speak to him; and if one did venture to ask him a question, his only answer was "Pish!"

"There is said to be a very remarkable bird here, called the nightingale," said the emperor. "Her song, they say, is worth more than anything else in all my dominions. Why has no one ever told me of her?"

"I have never before heard her mentioned," said the gentleman usher. "She has never been presented at court."

"I wish her to come and sing before me this evening," said the emperor. "The whole world knows what I have, and I do not know it myself!"

"I have never before heard her mentioned," said the gentleman usher, "but I will seek her."

But where was she to be found? The gentleman usher ran up one flight of steps, down another, through halls, and through passages; not one of all whom he met had ever heard of the nightingale, and the gentleman usher returned to the emperor and said:

"It must certainly be an invention of the man who wrote the book."

"But the book in which I have read it," returned the emperor, "was sent me by the high and mighty Emperor of Japan, and therefore it cannot be untrue. I wish to hear the nightingale; she must be here this evening, and if she does not come, the whole Court shall be flogged."

"Tsing-pe!" exclaimed the gentleman usher; and again he ran upstairs, and downstairs, through halls and through passages, and half the Court ran with him; for not one would have relished the flogging.

At last they met a poor little girl in the kitchen, who said:

"Oh, yes, I know her very well!"

"Little kitchen maiden," said the gentleman usher, "I will procure for you a sure appointment in the kitchen if you will conduct us to the nightingale."

So they went together to the wood where the nightingale used to sing, and half the Court went with them.

On and on they went till they reached the wood, and the little girl stopped before a tree.

"There she is!" said she. "Listen, listen! There she sits!" And she pointed to a little grey bird up in the branches.

"How simple she looks!" said the gentleman usher.

"Little nightingale!" called out the kitchen-maid, "our gracious emperor wishes you to sing something to him."

"With the greatest pleasure," replied the nightingale; and she sang in such a manner that it was delightful to hear her.

"Most excellent nightingale!" said the gentleman usher, "I have the honour to invite you to a court festival which is to take place this evening, when his Imperial Majesty will doubtless be enchanted with your delightful song."

"My song would sound far better among the green trees," said the nightingale. However, she followed willingly when she heard that the emperor wished it.

There was a general cleaning and polishing at the palace; the walls and the floors, which were all of porcelain, glittered with a thousand gold lamps; the loveliest flowers, with the merriest tinkling bells, were placed in the passages; there was a running to and fro, which made all the bells to ring, so that one could not hear one's own words.

In the midst of the grand hall where the emperor sat, a golden perch was erected, on which the nightingale was to sit. The whole Court was present, and the little kitchen-maid received permission to stand behind the door, for she had now actually the rank and title of "Maid of the Kitchen." All were dressed out in their finest clothes; and all eyes were fixed upon the little grey bird, to whom the emperor nodded, as a signal for her to begin.

The nightingale sang so sweetly that she touched the hearts of all who heard her, and the emperor was so delighted that he said: "The nightingale shall have my golden slippers and wear them round her neck." But the nightingale said:

"I have seen tears in the emperor's eyes. That is the greatest reward I can have."

Yes, indeed, the nightingale's success was complete. She was now to remain at court, and to have her own cage, and all the city was talking of the wonderful bird.

One day a large parcel arrived for the emperor on which was written "Nightingale."

"Here we have another book about our far-famed bird," said the emperor.

But it was not a book; it was a little piece of mechanism, lying in a box—an artificial nightingale, which was intended to look like the living one, but was covered with diamonds, rubies, and sapphires. When this artificial bird had been wound up, it could sing one of the tunes that the real nightingale sang; and its tail, all glittering with silver and gold, went up and down all the time. A little band was fastened round its neck, on which was written: "The nightingale of the Emperor of China is poor compared with the nightingale of the Emperor of Japan."

"That is famous!" said everyone; and he who had brought the bird obtained the title of "Chief Imperial Nightingale Bringer." "Now they shall sing together; we will have a duet."

And so they must sing together; but it did not succeed, for the real nightingale sang in her own way, and the artificial bird produced its tones by wheels.

"It is not his fault," said the artist; "he keeps exact time, and sings quite according to method."

So the artificial bird must now sing alone; he was quite as successful as the real nightingale. And then he was so much prettier to look at; his plumage sparkled with jewels, silver, and gold.

Three-and-thirty times he sang one and the same tune, and yet he was not weary; everyone would willingly have heard him again. However, the emperor now wished the real nightingale to sing something. But where was she? No one had remarked that she had flown out of the open window, flown away to her own green wood.

"What is the meaning of this?" said the emperor; and all the courtiers abused the nightingale, and called her a most ungrateful creature. "We have the best bird, at all events," said they. And for the four-and-thirtieth time they heard the same tune; but still they did not quite know it, because it was so difficult.

The real nightingale was banished from the empire; but the artificial bird had its place on a silken cushion, close to the emperor's bed. All the presents he received, gold and precious stones, lay around him; he had obtained the rank and title of "High Imperial Dessert Singer."

Thus it went on for a whole year. The emperor, the Court, and all the Chinese knew every note of the artificial bird's song by heart; but that was the very reason why they enjoyed it so much—they could now sing with him.

But one evening, when the bird was in full voice, and the emperor lay in bed and listened, there was suddenly a noise, "bang!" inside the bird; then something sprang, "sur-r-r-r!" all the wheels were running about, and the music stopped.

The emperor jumped quickly out of bed, and had his chief physician called. But of what use could he be? Then a clockmaker was fetched, and at last, after a great deal of consultation, the bird was in some measure put to rights again; but the clockmaker said he must be spared much singing, for the pegs were almost worn out, and it was impossible to renew them. There was great lamentation, for now the artificial bird was allowed to sing only once a year.

When five years were passed away, a great affliction visited the whole empire. The emperor was ill, and it was reported that he could not live.

Cold and pale lay the emperor in his magnificent bed. The floors of all the passages were covered with cloth, in order that not a step should be heard; it was everywhere so still—so very still. But the emperor was not yet dead. Stiff and pale he lay in his splendid bed, with the long velvet curtains and heavy gold tassels. Death sat at the emperor's bedside, and the emperor was afraid. A window was opened above, and the moon shone down on the emperor and the artificial bird.

"Music, music!" cried the emperor. "Thou dear little artificial bird, sing, I pray thee, sing! I have given thee gold and precious stones; I have even hung my golden slippers round thy neck! Sing, I pray thee, sing!"

But the bird was silent; there was no one there to wind him up, and so he could not sing. Death continued to stare at the emperor with his great hollow eyes; and everywhere it was still—fearfully still.

All at once the sweetest song was heard, and the room became filled with such beautiful sounds that Death could not stay. The music of the real living nightingale could vanquish Death, who, like a cold white shadow, flew out at the window.

"Thanks, thanks!" said the emperor. "Thou heavenly little bird, I know thee well. I have banished thee from my realm, and thou in return hast brought me back to life. How shall I reward thee?"

"Thou hast already rewarded me," said the nightingale. "I have seen tears in thine eyes, as when I sang to thee for the first time. Those I shall never forget; they are jewels which do so much good to a minstrel's heart. But sleep now, and wake fresh and healthy. I will sing thee to sleep."

And she sang, and the emperor fell into a sweet sleep. Oh, how soft and kindly was that sleep!

When all the people knew that their emperor was whole again, their joy knew no bounds, and the little nightingale was the most popular person in the land.

The emperor begged her to stay with him and live in the palace, but to this she would not consent.

"I must be free," said she. "But in the evening, when you are alone, I will come and sit on the branch of a tree by your window and sing to you of the good and evil of the world, and fill your mind with beautiful, helpful thoughts."

THE BLUE BIRD

Princess Florina was so beautiful that, when King Charming saw her portrait, he fell in love with her, and came with his minister to ask her hand in marriage. Unhappily, Princess Florina had a wicked stepmother and an ugly stepsister, who was called Troutina because her face was as spotted as a trout's skin. When King Charming arrived, the stepmother took him to Troutina, whom she had arrayed in the richest robes and the loveliest gems which she possessed.

"But where is Princess Florina?" said the king, frowning. He saw her sitting in a corner, dressed in calico, and hastened to her and said, with a tender smile:

"Princess, you do well to dress plainly. Beauty such as yours needs no adornment."

"Don't waste compliments on Florina," said the stepmother. "She is a very vain girl. Look! Dear Troutina is waiting for you."

The king, however, stayed beside Florina, and talked with her for three hours, and talked so sweetly that he won her heart.

But when he came next morning he could not find her. The stepmother had shut her in a high tower. King Charming then resolved on desperate measures. He bribed a maid to show him the window of the chamber in the tower where the princess was imprisoned, and he came there at night with a carriage and a long ladder, and climbed up to the window. A veiled girl appeared, and he lifted her down and put her in the carriage and drove off with her.

"Take me to the lodge in the forest," she said. "My godmother lives there, and she will help me."

They reached the lodge, and a dwarf opened the door, and showed the king and the veiled girl into separate rooms. The wall between the rooms, however, was very thin, and the king heard two voices speaking, and listened.

"How did you manage it?" said the first voice.

"Oh," said the second voice, "a maid told me that the king had bribed her to show him where Florina was imprisoned! So I removed the princess into the garret, and went into her chamber and veiled myself, and King Charming came and carried me off in her stead. Having eloped with me, he cannot now refuse to marry me."

"But I do refuse!" cried the king, striding into the next room, where he found Troutina talking with a witch.

"Wait!" said the witch. "You have not yet been asked to marry my god-daughter. I will teach you first to esteem her, and when she deigns at last to offer you her hand, you will not refuse it."

Striking the king thrice with her wand, the witch danced around him, and sang:

He who flirts and flies away
  Shall have wings to carry him!
Shrike and hawk and shrieking jay
  Hunt him down and harry him!
Till the maid he slights to-day
  Condescends to marry him.

King Charming at once changed into a blue bird, and flew out of the witch's lodge into the forest.

The next morning, when Princess Florina opened her window, a blue bird flew down with an emerald ring in its beak, and put the ring on the window-sill, and then perched there and sang to her so sweetly that she said:

"Charming! Charming!"

"Ah, you still know me!" said the blue bird. "Yes, dearest, I am King Charming. I have been changed into a bird because I would not marry vile Troutina."

"And I have been imprisoned because you are in love with me," said the princess. "But never mind. We can now see each other more often than we could before."

'Put this ring on your finger," said the blue bird. "I flew into my rooms early this morning to get it for you. It is an engagement-ring."

The princess kissed the blue bird very tenderly, and put on the ring.

"Now," said the blue bird, "I will return and fetch a bracelet I had made for you."

But Troutina had seen the blue bird enter Princess Florina's chamber, and she had got a fierce hawk, which she flew at the blue bird as it came out of the window. Happily, King Charming's minister, who had been searching everywhere for his master, chanced to be passing, and he picked up the poor blue bird as it fell wounded to the ground.

Being a wizard as well as a minister, he was not at all astonished when the blue bird spoke to him and said that it was the king. On learning all that had happened, he took the blue bird to the witch, and said that King Charming would marry Troutina in a week's time, if he were at once healed and restored to his own shape; and with three strokes of her wand the witch undid her spell.

"Keep the witch quiet by preparing for the wedding," said the minister to the king, "and I will find another wizard, and the two of us will outwit her."

Troutina and her mother set out for King Charming's palace, where the marriage was to take place, and Princess Florina escaped from the tower and followed them, saying sadly to herself:

"I must see him and return the ring."

When she reached the palace the people had assembled to see the wedding procession, and, owing to a strange commotion inside, she was able to enter unperceived. On reaching the great hall, she saw two pigs rushing about, with the witch, very much excited, running after them.

"It's no use," the king's minister was saying to the witch. "There is another wizard here besides me. Troutina and her mother have been turned into pigs, and pigs they shall remain."

"On with the wedding procession!" cried King Charming, catching sight of Princess Florina. "The real bride has come." And, kissing Florina, he led her to the royal carriage, and as they drove to the cathedral all the people shouted "Hurrah!" and danced and sang with glee, because the king was going to marry the beautiful princess whom he loved so much.

THE WITCH WAS RUNNING AFTER TROUTINA AND HER MOTHER, WHO HAD TURNED INTO PIGS

SOME ENGLISH LEGENDS

ST. VINCENT'S ROCKS

VINCENT and Goram were giants, so tall that they could look over the tops of trees, so strong that they could use a pickaxe with a handle sixty feet long. They lived by the River Avon, near Bristol, and it was Vincent and Goram who cut a way for the river through the rocks. But they had only one pickaxe, and agreed, therefore, to work in turns. Vincent worked for an hour, and then threw the pickaxe to Goram, who began digging at a spot three miles away. Then Goram in his turn threw the axe back to Vincent.

One day, as Goram rested in the big armchair he had cut out of the rocks, he fell asleep, and did not hear his brother shout that the axe was coming, so that the axe hit him on the head with great force and killed him.

Vincent was heart-broken, and burying his brother's body in the sea, he piled up rocks and clay from the glen—now called Coombe Dingle—and made a mound so big that the waters could not reach over it. Beneath Dunball Island, it is said, Goram still lies, and the rocks through which Vincent cut the way alone are called St. Vincent's Rocks even to this day.

BYARD'S FAMOUS LEAP

NEAR Newmarket, in Lincolnshire, there are three marks of a horse's hoofs, and each mark is seven yards distant from the other. Every man who farms the field is careful to keep these marks from being grass-grown or ploughed up. For they are the famous marks of Byard's leap, which is recounted in the following story:

There was once a witch of Newmarket who bewitched the cattle and crops of her neighbours, and did all sorts of mischief, and at last one farmer went to a wise man and asked him what to do to overcome the witch.

"Tie a naked dagger round your waist," said the wise man. "Then drive your horses into a pond at night and throw a stone into the pond. Mount the horse that lifts his head up first, and gallop off to the witch's hut, and bid her out to ride with you." Byard, a blind horse, was the first to raise his head when the farmer threw the stone, so the farmer mounted him and galloped to the witch's hut and cried:

"Out and ride with me! Out and ride with me!"

And out came the witch. She jumped at the horse, and Byard made his first leap, and got away. She jumped again, and Byard made his second leap and got away. At the third leap she sprang behind the farmer and wound her skinny arms about his waist. But the dagger cut her left arm, and she lost all her power, and was never able to trouble anybody again.

THE FAIRY TULIPS

SOME time ago an old woman came to live by a fairy field on Whitchurch Down, in Devon, and she planted about her cottage a garden of tulips. The fairies got very fond of these gay flowers, and under their care the tulips became more fragrant than any rose or violet, and they blossomed all the year long.

The fairies used to carry their babies at night into the garden, and put them in the tulips, and rock and sing them off to sleep; and they sang so sweetly that the old woman often sat up late to listen to their singing.

But at last the old woman died, and the new tenant uprooted all the tulips and sowed cabbages in the garden. This made the fairies very angry, and they bewitched the garden, so that nothing could ever grow there again. Then they planted the tulips on the grave of the old woman, and there, it is said, the fairy flowers still bloom.

THE STORE THAT NEVER GREW LESS

ONE wild winter night, a little woman in a green cloak knocked at a farm on the east coast of Buchan, and asked for the loan of some oatmeal. The farmer's wife had only meal enough for three days, but she gave the little woman half of it. The next night the little woman brought back the meal and said:

"Mix this with the rest, and you will not want any more."

In the night there was a very great snow-storm, and the roads were quite blocked up for thirteen weeks. All that time everybody in the farm had to live on the fairy meal, and no matter how much they ate, their scanty store never grew less, thanks to the good fairy.

THE SAD HEART OF LITTLE TROTT

This pathetic little story is told by the French writer, André Lichtenberger.

A GREAT sorrow has overwhelmed the heart of Trott.

No one loves him any more at all. Well, perhaps, just a very little still; but it is not as it used to be. And when one has been petted and loved tremendously, that is not enough. Trott has a heart like lead; it is just as if he had eaten too much apple-tart. And to-day things have gone worse than ever.

This morning Trott was taking his lesson with his governess, and he was grumpy. Although, as a rule, he is very polite, he said a word to her which was not quite proper. And papa, who was coming in at that moment, heard it. Trott was not allowed to have any dessert. Alas! there was whipped cream that day.

After luncheon Trott hurried away from the room to stretch his legs. He rushed angrily out of the dining-room, and slammed the door. His baby sister woke up and uttered a dismal howl. Mamma said: "Trott is insufferable!"

TROTT GETS UP AND STANDS ON HIS CHAIR

That evening, when he returned from his walk, it was almost dark. At such a time one has a rather melancholy feeling, and it is nice to be petted. Trott thought he would go and find his mother, and sit in his usual place in his own little chair beside her couch. He found the place occupied by little Lucy in her cradle.

Mamma was so busy crooning and making pretty faces to the baby that she gave Trott scarcely more than one hasty little kiss. Trott felt very cold, and bruised about the heart. He went to the window and sat there quite alone, watching the night's slow descent over the garden.

And now papa comes in. He takes a seat close to baby-girl, and says over his shoulder to Trott:

"Hallo, my boy! Are you still sulking?" And then he begins chatting with mamma about baby, who is clutching his finger.

Trott hides himself in his corner. His wretchedness grows still deeper. It is certain now, absolutely certain, that no one loves him any longer. Hitherto, when he was naughty, they scolded him a little, and then it was over; they embraced him more than ever afterwards, so that he felt it was very good to have been scolded. But to-day they have scolded him severely, and have not caressed him at all afterwards. What shall he do? Oh, to think how they had once loved him—a great deal, ever so much! And when he had been ill—ah, they had loved him tremendously then! Suppose he were to fall ill now! Perhaps . . .

It is an idea. Baby has been carried away. Nobody is looking. Father and mother are talking in a low tone. With a quick movement Trott gets up and stands on his chair. He leans both hands on the back and gives a strong push. The chair falls over with a frightful crash, and Trott rolls on the floor into the middle of the room.

Mamma utters a loud scream. Papa rushes towards Trott and hurriedly examines his forehead. But mamma wishes to have him to herself; she snatches him up, takes him upon her lap, hugs him, caresses him, calls him all manner of dear and tender names. Trott cries with joy and with pain, for he has a big bump on his forehead.

"How did you manage to fall over, poor little man?"

Trott cannot reply. He is sobbing too fast. At last he manages to blurt out, between two big sobs:

"I—did it—on purpose!" Father and mother look at each other in bewilderment. What can the boy mean? What is to be said to that?

One must never tell a lie. Although it is difficult, with so many tears running away from his eyes, Trott tells the whole truth. He did it on purpose because he wanted to know if mamma and papa really did love him any longer. He knew, of course, that they could not love him, being old, as they loved his sister, who was new. But he thought that perhaps they could still love him a little bit. He wanted to find out. And now he is quite happy, he is very glad, although . . . The torrent of tears increased in violence.

Mamma passes a loving arm around Trott's neck and gently mops his scalding eyes. Papa holds the little hands in his. They both smile, but it is a very tender smile. The music of their sweet and gentle words begins to soothe Trott's heart. He is told something, too, which appears very grand and wonderful in his ears. It is quite plain that he is loved just as much as ever, quite as much even as little Lucy. They love her because she is so weak and helpless. He is a fine, big, strong boy, and he must watch over baby sister, guard her and help her, because she has no strength. It is Trott's duty to look after this baby. And they love him quite the same, most certainly, every bit as much.

Papa lifts up his little son in his arms, presses a big kiss on each cheek, and asks, as he looks him in the face:

"Now, are you comforted at last, my little man?"

And Trott replies, his eyes still red, but with his lips full of smiles:

"Yes; but, all the same, I am very glad I made such a big bump."

THE WOODEN DAUGHTER OF DESCARTES

The great French philosopher, René Descartes, who was a diminutive man with a very big head, wanted to prove that animals have no souls. He held that all their movements could be explained without supposing that they possessed souls. In order to show how easily the power of movement could be given to a creature, he constructed a wooden doll, "a female automaton," which, by the very slightest touch, could be made to perform certain motions. This clever and ingenious doll became a jest, and people said that it was a real girl, the daughter of Descartes, and that her name was Francine.

And this was the end of Francine. The philosopher had occasion to send her a journey by sea, and the wooden daughter was packed in a box and put on board a Dutch ship. Now Francine moved so easily that the motion of the ship kept her tapping and rapping in her box all day long. The captain of the ship had the curiosity to discover what caused this tapping, and on lifting the lid of the box he was first amazed, and afterwards terrified, to behold a little female who jumped and bumped about, like an imp from the underworld. He touched her, and she felt like wood. Convinced now—for he was a superstitious man—that the occupant of the box was really a little fiend, he hastily seized up Francine and flung her, with violent quickness, far out to sea. And thus perished the wooden daughter of the great philosopher.

Of wooden figures that move, some ingenious craftsmen long ago gave us excellent examples. The famous Bishop Fisher exposed at St. Paul's, and afterwards broke to pieces for a cheat, a figure of a man which was able to bow down and lift itself up, to shake and stir the hands and feet, to move the head and roll the eyes, "to wag the chops," to bite the lip, and which had the power of "gathering a frowning, froward and disdainful face when it would pretend offence, and showing a most mild, amiable, and smiling cheer and countenance when it would seem to be well pleased." Credulous people, deceived by their senses, used to worship these wooden images, and believed it was their prayers which caused the movements.

Descartes tried to disprove a soul for animals by the very same means with which these men tried to deceive the ignorant. Francine was thrown into the sea, and the images into the bonfire.

SIR TRISTRAM OF LYONNESSE

A STORY OF KING ARTHUR'S TABLE ROUND

TRISTRAM was a king's son, and dwelt at Lyonnesse. He was famous at his father's court for his beauty, his courage, and his skill at music. But his stepmother hated him out of her jealousy, and the king sent Tristram to the court of the young man's uncle, King Mark of Cornwall, so that his stepmother should do him no injury.

Now, in Cornwall, Tristram found King Mark and all his knights in a state of fear. They had refused to pay tribute to King Anguish of Ireland, and the terrible knight, Sir Marhaus, had arrived with ships, and now lay off the coast challenging the bravest of Mark's knights to meet him in battle. None durst fight the great Irishman, and Mark bit his lips with rage. Then the beautiful Tristram of Lyonnesse said: "Make me a knight, and I will meet this Sir Marhaus."

So Mark made him a knight, and the strong youth, henceforth to be famous and eternal throughout Christendom as Sir Tristram of Lyonnesse, went out to encounter Sir Marhaus. They met on an island, and when Sir Marhaus saw how young was this knight, he courteously bade him think twice before meeting death so early.

But Tristram answered boldly, and their horses clashed together. Long was the fight. Both men were dashed from the saddle, and fought fiercely on foot. The lance of Sir Marhaus pierced the side of Tristram, and the blood flowed in a river; but bravely did the boy fight on, and at last, raising his sword, he brought it down on the head of Sir Marhaus so that it crashed through the skull.

Thus Tristram won his first fight. But his wound was sore, and it was said that to heal it he must needs go to the land of him who had dealt the blow; so Tristram passed to Ireland. Now, as he lay off the coast of that country, he sat upon deck playing the harp, and the music reached one who ran to King Anguish with the news of it, and King Anguish sent for Tristram. Tristram, who had slain Sir Marhaus, brother of the Irish queen, called himself Sir Tramtrist, and was welcomed by the king, the queen, and their daughter, the fair Isolt. To Isolt Tristram taught music, and she tended his wound, and they were like brother and sister together.

Now, at the court was a Saracen of enormous strength, by name Sir Palamides, who, although a heathen, did yet overthrow the knights of Christendom, and was proud and haughty and disdainful in his bearing.

THE GOOD SIR TRISTRAM DISCOVERS HIMSELF TO KING ANGUISH

This man teased Isolt with protestations of love, and would not take the maid's "Nay," but must always declare that before long she would love him.

So, one day, being at a tournament, for Isolt's sake, Tristram met this boaster; and Tristram, who wore white armour and rode upon a white horse, crashed against Sir Palamides in black armour and mounted on a black horse, and with his lance drove the Saracen over his horse's tail, and only spared his life on condition that never again would he pester the fair Isolt.

Then Tristram returned to Cornwall; but his uncle, who sought a wife, sent him to Ireland to bring back the fair Isolt, that she might be Queen of Cornwall. Now, on the way back to Cornwall with Isolt, as he lay at her feet on the ship's deck harping, Tristram grew thirsty, and seeing near him a flask, he gave it first to Isolt to drink, and then himself drank. Now, this was a love potion made by Isolt's mother for Mark and Isolt only; for those who drank of this magic wine loved each other for ever after. And so it came to pass that when Tristram looked next upon Isolt, and Isolt looked upon Tristram, they loved each other with a great love, and were afraid.

Sir Tristram gave Isolt to King Mark, and then rode away and became Knight of the Round Table. And it came to pass that one day as Isolt walked in the forest, the Saracen suddenly appeared, and by guile carried her off. But as they rode through the forest a knight challenged Sir Palamides, and while these two fought, Isolt crept away, and was presently found by one who carried her to his castle in all honour. Then came the furious Sir Palamides to the castle, and sat down before it like one mad.

But Tristram, who had heard of Isolt's danger, rode up before the castle, very terrible and calm, and gave battle to Sir Palamides. The din of their fighting reached Isolt, and she looked from the window; and when she saw the Saracen stretched upon the green grass, and Sir Tristram standing over him with lifted sword, she cried to him to spare. And at the sound of her voice Tristram grew pale and shook exceedingly, for he loved her dearly. Then, on condition that Sir Palamides became a Christian and joined the brotherhood of King Arthur, he spared him, and Sir Palamides lived to be a very gentle and honourable Knight of the Round Table.

Then Sir Tristram carried Isolt to King Mark, and tarried long at the Court of Cornwall. But King Mark hated Tristram; and one day, as Sir Tristram harped to Isolt, the villainous Mark sprang from a hiding-place and clove Sir Tristram through the skull; and the death of Tristram broke the heart of the fair Isolt, and she faded away.

THE BRAVE SIR TRISTRAM OF LYONNESSE, WHO DEFEATED THE SARACEN KNIGHT

This photograph and that on page 3211 are by Messrs. Ellis and Walery.

THE NEXT STORIES ARE ON PAGE 3305

The Child's Book of Its Own Life

WHAT THIS STORY TELLS US

THERE is no food question that people differ so strongly about as the eating of meat. And we know that different animals have very different opinions on this subject, too. Some people even think it is wrong to kill animals for their flesh, but most people think it not wrong so long as the animals are killed mercifully. Nearly all well-to-do people eat too much meat; everyone who knows is agreed about that. As for children, they need even less meat than grown-up people do, and often suffer even more severely than grown-up people from taking too much meat. Fish is a cheap and good kind of meat, and eggs are, of course, animal food, just as milk is, though people call themselves vegetarians who could not get on for a day without milk and its products. Eggs, as we learn here, are very good for children, as they are for everybody. It is a pity that, like animal foods in general, they are not cheap.

THE VALUE OF MEAT AS FOOD

CONTINUED FROM 3113

THE kind of food that we must now study is a very important one, whatever the real truth about it may be. Very nearly all of us like meat. It has such a great deal of taste, and even when we are taking other things, we like a little meat flavour in them. Now, there are several arguments of one kind and another why we should not eat meat, and there are several which suggest that we should eat meat. One thing is quite certain, at any rate, and that is that we are wrong if we make up our minds before we have looked at the facts. There is a special word, *prejudice*, which literally means "judging before," that is, to decide before we have a right to judge; and in this question of eating meat most people are prejudiced. We must try to be fair, and to follow the truth wherever it leads.

Now, in the first place, let us consider the most important of all the arguments, and that is whether it is right to take life for the purposes of food. Some religions have taught that it is wrong. There are parts of the world where a man will move the tiniest worm or insect out of the path, lest someone should tread on it, and where it is regarded as wrong to take life of any kind, even the life of a poisonous serpent or biting insect. Perhaps the truer idea is that it is wrong to take life for pleasure, but that it may be quite right to take lower forms of life in order to serve higher forms of life; perhaps it is wrong to kill a serpent just for fun, but it is certainly right to kill a serpent to save a child. Now, when we eat meat, of course it means that an animal has been killed. This is true also when we eat an egg, for the egg is a very young animal. But no one really objects to the eating of eggs, because we know that when we kill the egg, which we do when we cook it, we inflict no cruelty. That, surely, is the real question. In the case of the sheep or the ox, then, we have to remember, first, that in any case the animal must die some time, for all living creatures are mortal. If we kill it without pain and instantly, that is far more merciful than if the animal were allowed to die of disease or old age, and a thousand times more merciful than Death is in his dealings with mankind; and we may say that while the animal was alive it enjoyed its life, and that though we brought the animal into existence for our own purposes, yet it owes to us the happiness it had during its life.

This means that the highest question regarding the eating of meat is the question as to how the animals are killed. Whenever there is reason to suppose that animals are killed less quickly than need be and with some cruelty—either by carelessness or to save expense, or because the meat looks nicer, or for any other reason—then we should protest, and say that we will not eat meat unless we know that the slaughter-houses are as good as they can be in this respect. But if these conditions are complied with, then surely we may say that so far from our practice of eating meat being a cruel one, it really means conferring the pleasure of life upon a great many creatures which would otherwise not have come into existence at all, and that the only price which they have to pay is the price which all creatures must pay for life, and that the smallest possible—a painless, unfeared death.

So now, if we always remember this question about the killing of the animals, I think we may regard the moral question as satisfactorily settled, and may go on to study the good and bad results of meat-eating simply as a question in the science of the body. There are, first of all, some very interesting arguments derived from the study of life, which we ought to know.

SOME CLEVER ANIMALS THAT EAT FLESH, AND OTHERS THAT EAT GRASS

When we study the higher animals, it is not possible to prove from their diet that it is better either to eat meat or not to eat it. It is true that the carnivorous, that is, the flesh-eating, animals are very intelligent, quick and graceful in their movements. We can see this with both the big cats and the little cats at the zoos, and it is, of course, interesting to compare their quickness with the slower movements of herbivorous, or grass-eating, animals, like oxen and sheep.

We know, too, that one of the most intelligent of animals is the dog, which is really a tame kind of wolf, and is carnivorous. But there are animals more intelligent than the dog: these are the monkeys and the apes, and none of them eat flesh. The truth, I believe, is that the quickness and intelligence of the flesh-eating animals is not derived from the flesh they eat, but is due to the fact that animals which live by hunting other animals must be quick and intelligent, if they are to live at all.

The intelligence of the higher apes is the highest in the world, with the exception of our own. Yet fruits and nuts, and that kind of thing, make up their food. Their teeth and ours are very closely alike; they are, indeed, the same in number and arrangement, and differ only in small details. They are certainly not the teeth of animals meant to seize and kill other animals. It is true that the gorilla has huge canine, or eye, teeth, but they are for fighting other gorillas with, and not for carnivorous purposes.

THE MAN-LIKE APES THAT LIVE ON FRUIT AND NUTS

So, as far as that goes—as it is very probable that the higher apes and mankind are descended from a common ancestor—we might argue that human beings ought not to eat meat. But that would not be a right argument. In the first place, we find when we study the apes that, though they are not beasts of prey, yet if meat is given to them, they soon learn to like it very much, and thrive exceedingly well upon it; and also a well-known student of the subject has produced evidence which makes us think that, as man has grown in intelligence, his diet has passed from the fruit and nut stage to include meat. So as far as all this goes, though it is very interesting, it is not conclusive in any direction.

Another kind of argument has been based upon comparing different races of men, and also different individuals, with one another. People say that the races that eat the most meat are the leading races of the world, and want us to believe that it is the meat that makes them the leading races of the world. Others say that the races that eat most meat are the brutal, war-like oppressors of the world, and want us to believe that it is the meat that makes them brutal. Now, the question is: Are the facts as they are stated, and would they mean what they are supposed to mean if they were really the facts?

MEN OF MUSCLE AND MEN OF MIND WHO EAT NO MEAT

Almost the most important truth about man, as we have already learnt, is his amazing power of adaptation. The vegetarians in our own country have shown us, during the last twenty or thirty years, that, without the use of meat, it is possible to make athletic records, and to turn out splendid and vigorous works of the mind. They have proved that, and we have to recognise the fact, whether we like it or not.

It used to be said that if we did not eat meat we should become weaklings, soft in body and mind. This is not true, and we have to admit that it is as possible to be strong, both in body and mind, without meat as with it.

SOME PEOPLE WHO SHOULD EAT MEAT AND SOME WHO SHOULD NOT

On the other hand, nobody has yet begun to prove that we should necessarily become stronger, either in body or mind, if we ate no meat. The truth probably is that the great majority of people can adapt themselves equally well to either kind of diet, if they go wisely about it. Also, there is a certain number of people who are so made that it is much better for them to eat meat, while others are better without meat. But, apart from exceptional people, let us see what facts we may be sure of.

It is certain that the *colour* of meat proves nothing as to its use. Nothing makes such good red blood as white milk. The redness neither of meat nor of red wines has any virtue for the making of blood. The only important point about the colour of meat is that white meat, like the breast of a chicken, is more easily digestible than butcher's meat. This is true also of many kinds of fish. All the meat we eat is made of muscle fibres, and muscle fibres vary very much in size and length. The smaller and finer they are, the more easily are they digested; but all white muscles are not easily digested, for the muscle fibres of such a creature as the lobster are very tough and thick, and very difficult to digest.

We learn, then, that the colour of muscle food, in general, proves nothing as to its value. There is some meaning, however, in the *taste* of it. When a food is liked, we know that it is specially liable to call forth the digestive juices, and that is a real recommendation.

THE GREAT FOOD-VALUE OF MEAT SOUP TO SOME PEOPLE

It has also been proved that, even apart from taste, the flavouring substances in meat are more powerful in calling forth the juices of the stomach than any other food. Careful experiments have been made by a great Russian observer, and of all the substances tried, none calls forth the juices of the stomach either in such quantity or in such strength as meat does. From this it follows, in the case of people whose appetite really needs to be helped, that it is sensible to begin a meal with a little clear meat soup. Clear meat soup contains no food matter at all, the food part of meat being tasteless and solid, but it does contain the substances which help the stomach to do its work. Is not the fact that the flavouring matter of meat has this effect upon the stomach a very strong argument in favour of the view that our bodies are naturally adapted to eat meat ?

The true food-value of meat depends upon the tasteless, colourless, odourless albumen which makes up the greater part of it, and, secondly, upon the salts it contains. Extracts contain merely the flavour of the meat, omitting all the food except the salts.

THE WILD RUSH OF THE GRASS-EATING ANIMALS TO OBTAIN SALT

It is interesting to know that vegetarian animals, who do not get enough salt in their food, are known sometimes to rush wildly for miles to places where salt can be obtained. These places are sometimes called salt licks. Every creature must have salt, and especially sodium chloride, which is common salt, in its blood. Muscle is rich in sodium chloride, and so animals that live on muscle get enough of it.

It is very important that we should know how far meat is useful for children, and so we must specially discuss that now, as it is really more useful for us in this book than the general question about the use of meat. First, children, like all other living things, differ from one another; one child will like meat, and another will dislike it. Now, in so far as these likings and dislikings are natural to the child, they should very largely be trusted. If the child is in health, and has not had its taste perverted, its body, of which the appetite is the voice, probably knows what is good for it better than other people are likely to guess. *But* we ought to be sure that we are dealing with natural appetite, and not with something that has been made by the special way in which the child has been fed. Many children, indeed, probably most children, if they are regularly and carefully offered highly flavoured dishes, gravies, and beef extracts and soups, and so on, will very soon get to like meat very much, and will probably be inclined to take much less than they should of foods which, at any rate for them, are simpler, safer, and better. We have Nature's guidance, after all. The food she provides for the child when it is very small has practically no flavour at all. Neither the mouth nor the stomach of a healthy child requires food to be highly flavoured.

THE FOOLISHNESS OF FORCING MEAT UPON YOUNG CHILDREN

Where a child does not care for meat, nothing could be more foolish than to force meat upon it. The appetite of the child that does not care for meat much is far more likely to be the natural unspoilt appetite than not. Meat is a necessary food for no one; it has its risks for all, and least of all is it especially good for children. Probably, the less meat a child has, the better; and nothing is more certain than that if a child be properly fed in other ways, especially with abundance of milk, it suffers no loss of strength or vitality from the omission of meat.

The flavouring substances of meat are of the nature of stimulants, not only to the digestion, but also to the brain. As Baron Liebig said, they make us aware of our strength. Doubtless, this often gives a real value to meat and to preparations of meat in the case of grown-up people, but there is a time to stimulate and a time not to stimulate. Something is always very wrong somewhere when a child needs a stimulant. The natural, healthy child is a perpetual motion machine, except when it is asleep, and its splendid activity puts most of its elders to shame.

WHY LITTLE CHILDREN SHOULD NOT EAT MUCH MEAT

Lucky, indeed, are the grown-up people who have something of the child left in them in this respect, as in many others. Grown-ups may perhaps want stimulants to make them like children, but the problem of the child is rather, if there is any problem at all, to prevent it from getting too excited, and to persuade it to go quietly to bed. In these days, especially, children are apt to become excitable, and then, of course, they have to pay the price for being over-excited. They do not sleep deeply enough, perhaps they have dreams, or even wake up suddenly, terribly frightened. In many cases it will be found that if we have the wisdom to stop giving the child the stimulants which it does not need, and which are only bad for it, we shall cure these troubles. No child should have tea or coffee, as we shall see later, nor any but very small quantities of meat and preparations of meat. We need not fear that the child will suffer. There is no lack of strength or vitality about the gorilla or the elephant or the horse; and these get their strength without eating muscle. The biggest and strongest flesh-eater amongst men is no match for any of these, so far as physical strength is concerned.

It seems now quite certain that well-to-do people, both in this country and in England, eat far more meat than they need, and far more, indeed, than is good for them. As meat is a highly expensive food, this is, of course, a waste from the point of view of money; but the stimulating substances in meat are capable of injuring the body, if they are taken too freely, and that is more serious than injuring the purse.

THE GREAT DIFFICULTY MEN HAVE IN BECOMING TRUE VEGETARIANS

We may fairly say that, during the last fifteen years, all the work that has been done on the subject of food has been in the direction of lessening the importance of meat, reducing the amount of it that is thought desirable to eat, and strengthening the case of the people called vegetarians. It is fair to remember, however, that very unsatisfactory results follow the attempt to live on a really vegetarian diet. So-called vegetarians take milk, which is an animal food, of course, and which, with its various products, butter and cream and cheese, makes all the difference to them.

Of course, the herbivorous animals, after they are very small, take neither milk nor eggs, and are genuine vegetarians. But most vegetable food, such as grass, contains only a very small proportion of real food substance in it, therefore the quantity that has to be eaten is very large, and the business of digesting is very serious. We find, then, that the ox, for instance, has to have a very complicated stomach, which takes up a great deal of room, and strongly contrasts the shape of its body with the shape of, say, a greyhound's body—for the greyhound lives on concentrated muscle food, and its digestive organs can afford to be quite small. So human vegetarians are apt to have not the most elegant of figures. Also, it can easily be proved that the digestive organs of man are nothing like so capable of dealing with vegetable food as are those of such an animal as the ox. They are not so large or so complicated, nor so strong; and they cannot produce nearly such powerful juices.

ANIMALS THAT HAVE TO KEEP EATING ALL THE TIME THEY ARE AWAKE

Still more interesting is the question of time. The herbivorous animal has practically to spend the whole of its time eating, when it is not asleep. I do not say that this is so if we supply it with specially nutritious kinds of vegetable food. But if we allow for the labour and time required in digesting as well as for the time required for chewing, in the first place, we shall soon see that the vegetarian has to devote far more of his life to eating than the person who takes his food in a more concentrated and more digestible form, and who, therefore, has far more time to devote to the real business of living; for we human beings, at any rate, must eat to live, and not live to eat.

Fish is, of course, really a form of meat. It is a very good food, very cheap—unless we choose to pay for flavour — and the eating of large quantities of it is less liable to injure the body than is the case with butcher's meat. There is no truth in the notion that fish has a special value for the health of the brain. Fish does not contain more phosphorus than other kinds of meat, as used to be supposed.

THE GREAT VALUE OF EGGS AS A FOOD FOR MAN

Eggs are excellent food. We know what the egg becomes, and everything that makes up the body of the living chicken must have been in it except for a certain amount of oxygen, which was breathed in through the eggshell. White of egg very largely consists of water; indeed, only little more than one-tenth part of it really consists of albumen. The yolk of egg is by far the most nourishing part, and nearly one-third of it consists of fat. The form in which fat occurs in the yolk of egg is one which makes it very readily digested, compared with many other kinds of fat. Eggs are very rich in phosphorus and in lime and in iron. In all these respects the yolk is much superior to the white. The yolk of egg, therefore, is a very specially good food for people whose blood is poor, and it has no superior for rickety children. In both cases, of course, we assume that it can be digested. No food, except milk, contains so much lime as yolk of egg does, and it is true alike of the lime, the iron, and the phosphorus that they are particularly easily taken in by the body.

The less an egg is cooked, the more easily it is digested. A hard-boiled egg stays in the stomach more than three hours—about twice as long as a lightly boiled egg. Practically the entire food substance in eggs is absorbed by the body—a great contrast with many foods, much of the food substance of which never gets into the blood.

THE BEST KINDS OF FOODS FOR BOYS AND GIRLS TO EAT

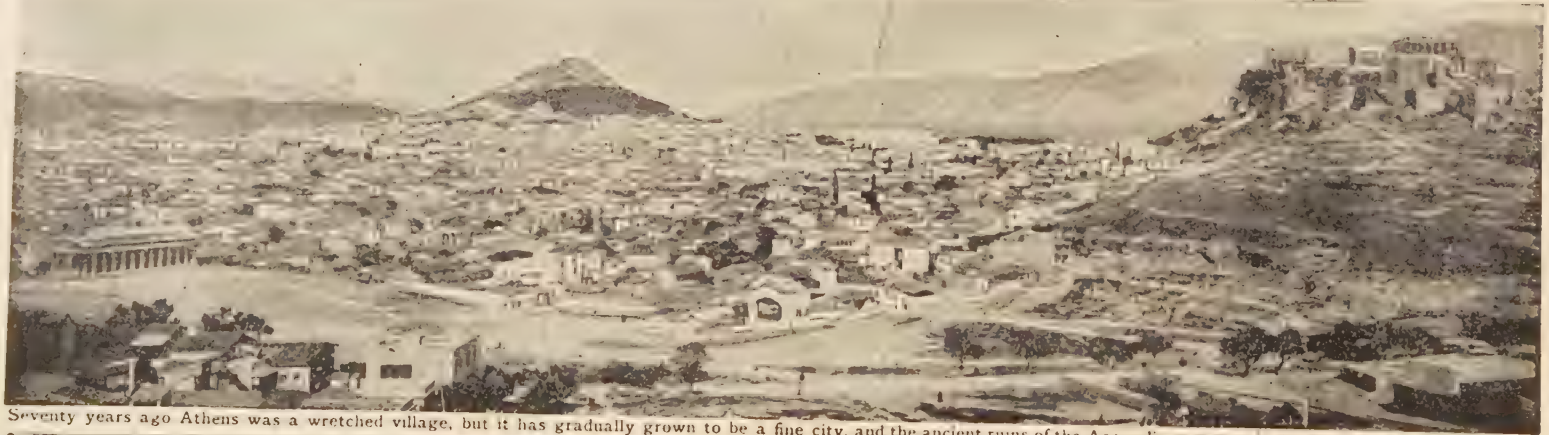
We cannot look upon eggs as cheap, unfortunately. They might, perhaps, be cheaper than they are if their value were better known and the supply were better organised. Like milk, eggs are highly to be recommended for children of all ages, and one may begin giving a little of the yolk of egg to a child after the first year of life. The best sources of proteid for children of all ages are milk first and foremost always; then oats and wheat, eggs, fish, chicken; and, at the bottom of the list, a little lightly cooked meat. Milk and its products, and yolk of egg, are also the best sources of fat that can be found.

It was shown by careful measurement upon a large number of factory children that, "between thirteen and sixteen years of age, they grow nearly four times as fast on milk for breakfast and supper as on tea and coffee."

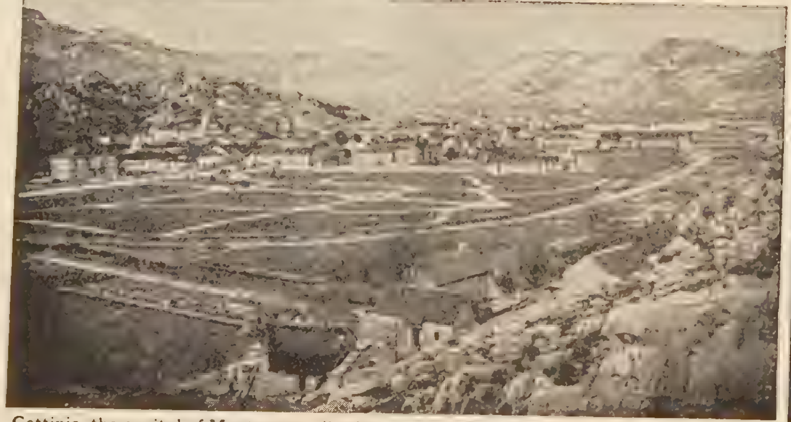
We have now learnt something about the more important foods upon which man depends for the building up of his body. We must next consider some of those substances which we eat and drink, but which are not really true foods.

The next part of this is on page 3315.

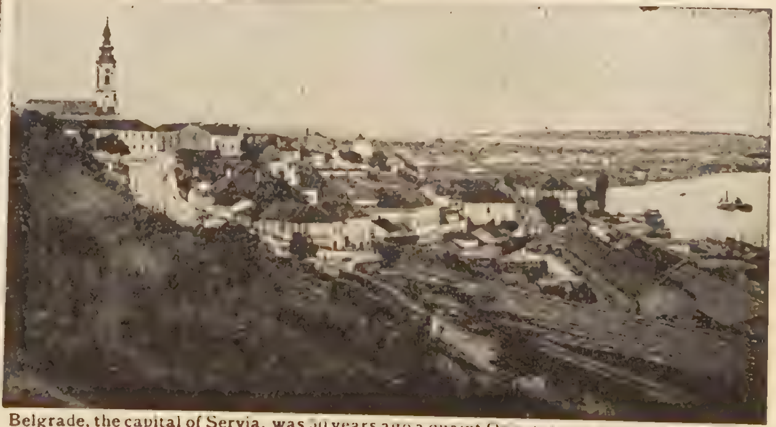
ANCIENT CAPITALS OF MODERN COUNTRIES IN THE NEAR EAST



Seventy years ago Athens was a wretched village, but it has gradually grown to be a fine city, and the ancient ruins of the Acropolis cast upon it the shadow of a glorious past.



Cettinje, the capital of Montenegro, lies in a rocky valley, two thousand feet above the sea.



Belgrade, the capital of Servia, was 50 years ago a quaint Oriental city with many mosques.

This picture shows the Sultan of Turkey listening, at the first meeting of the Turkish Parliament, to the announcement of the new constitution which he was compelled to grant to the people in 1908.

TURKEY AND THE BALKANS

GREECE, ROUMANIA, BULGARIA, SERVIA, MONTENEGRO

CONTINUED FROM 3158

We have seen how the flood of Turkish power spread over the Balkan Peninsula, absorbing the old Eastern Empire, and even over lands beyond the Danube and the Save, and then how the tide turned after the defeat at Vienna near the end of the seventeenth century.

The story of that ebbing tide, and of how the Christian peoples of the various old states and kingdoms have gained freedom from their Mohammedan rulers, is a long and sad one, though there is a happy ending.

All through the eighteenth century, when Western Europe was dreaming of wider life and greater liberties, and a feeling of growth was spreading to its remotest parts, a heavy dead weight of oppression, of almost hopeless sorrow, and fierce hatred between Mohammedans and Christians, between widely differing races, hung over the mountains and valleys of the Balkan Peninsula, and the weight was held down by the jealousies of surrounding nations. It was the work of the nineteenth century to "let go."

Let us turn first to the south, where beautiful Greece lay desolate and ruined by the long mismanagement of both Venetians and Turks. It was during the years of the French Revolution, and when Napoleon was turning Europe into a vast battlefield, that the Greeks determined to fight out their final struggle for freedom to the death. All their efforts to improve the state of their country, to start education, to resist injustice, proved useless, and they were forced into rebellion.

Many heroes rose up as leaders, often fighting like lions against forces much better armed, and in much greater numbers. Such were Marcos Bozzaris; and Constantine Kanaris, who ran a fire-ship into a harbour where lay the Turkish admiral's huge man-of-war. Constantine grappled the fire-ship close to the admiral's vessel, lighted the fuse; but while escaping under her stern in a small boat, he saw that the fire had blown out. Quick as thought he dashed back, relit the fire, sprang into his boat, and as he passed out of the harbour the enemy blew up with a tremendous shock.

Too long Christian Europe looked on at the unequal struggle, allowing their jealousies and their fears that Russia would become too strong if Turkey were weakened to prevent them helping the right cause. At last volunteers went out to help the Greeks, chiefly owing to the enthusiasm of the poet, Lord

Byron, who knew what they suffered and who loved the country and the gallant people. When the Sultan called to his aid a most cruel general from Egypt, the English, French and Russians joined together and destroyed the Turkish fleet in the Bay of Navarino. This was in 1827. When the French landed in the Morea, and hastened the departure of the troops from Egypt, that was the last of Turkish rule in Greece.

THE BUILDING UP OF THE MODERN KINGDOM OF GREECE

The boundaries of the country have since been enlarged to take in Thessaly and more of the lovely islands that fringe its shore, and the difficult work of restoring and building up has gone steadily on. The present king is the nephew of Queen Alexandra, and there is a fine constitution by which the people have a voice in the government. By degrees better ways of farming are being introduced, and much care and money is expended in bringing water to parts which are very dry. Most of the land belongs to the peasants who cultivate it, and trade is increasing, chiefly in the currants and other dried fruits, olive oil and sponges, for which Greece is famous. The Greeks, too, do most of the carrying trade in the Mediterranean. There are not many railways yet. Education is becoming more general, and there is a very fine university at Athens, the capital, which lies in a dry basin backed by hills, a few miles from the sea.

There are models of the "Hill of the City," the Acropolis, that towers above Athens in many of our museums, and there are also models of the great ruined building, which stands on its flat top, one of the wonders of the world. This is the Parthenon, the temple built more than 2,000 years ago for the worship of the goddess Athene, after whom Athens is named.

A PAGAN TEMPLE THAT BECAME A CHURCH AND THEN A MOSQUE

When Greece passed under the Christian emperors, the Parthenon was used as a Christian church. In the times of the Turks it became a mosque, and it was a Venetian bomb which reduced it to the state of ruin in which we see it now. A fine modern city, built of marble from a hill near the one which supplied the blocks for the Parthenon, has risen up below the hill and its ruins, which thousands of visitors come every year to study and enjoy.

Between the lower Danube—often ice-bound in winter—and the sweep of mountains formed by the Carpathians and the Transylvanian Alps, the two provinces of Moldavia and Wallachia were united to form Roumania about fifty years ago. This step came after long and sore trials and sufferings, similar to those endured in Greece. A good constitution was arranged to give the people rights in their government, and a prince was chosen; but they were still under Turkey to some extent. The representatives of the people declared their independence from the Turks in 1877, and a little later Prince Charles became King of Roumania.

In the capital—Bucharest—is a statue of the noble Queen of Roumania, Elizabeth, giving drink to a wounded soldier, a memorial of her goodness in the terrible war with the Turks that brought independence.

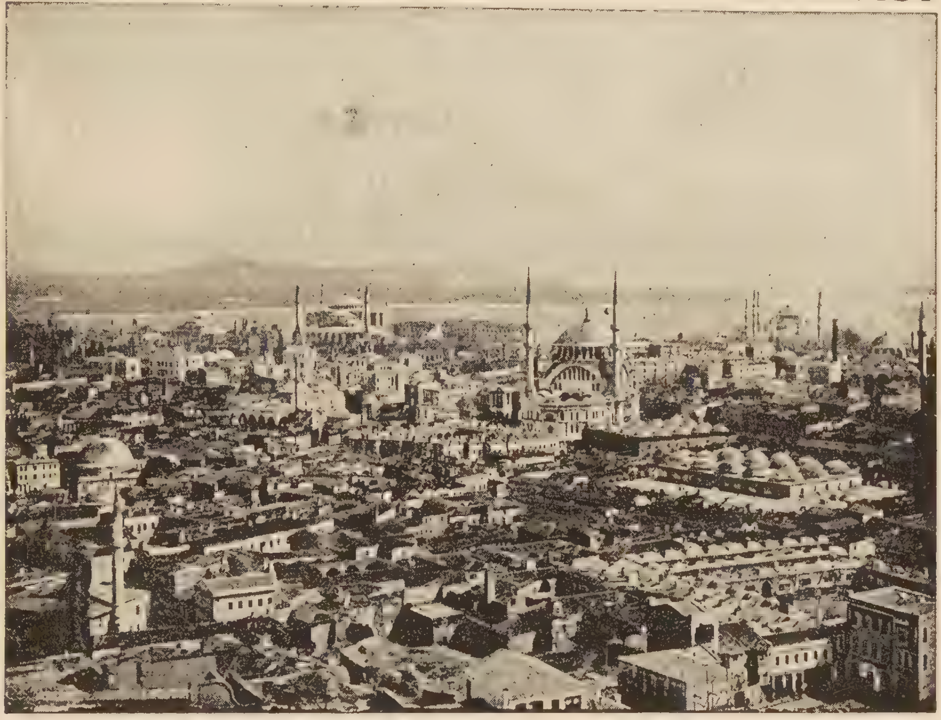
A NOBLE QUEEN WHO HELPED IN ROUMANIA'S FIGHT FOR FREEDOM

She earned then the title of "Mother of the Wounded." Her stories of her adopted country, of the sorrows of the convicts in the salt mines in the Carpathians, of the slavery of the farm servants in the wide plains of waving corn, of the hot spirit in which injuries are revenged, all help us to understand life in this country, nearly as large as England and Wales, and also to realise to what a state the Turks had reduced it.

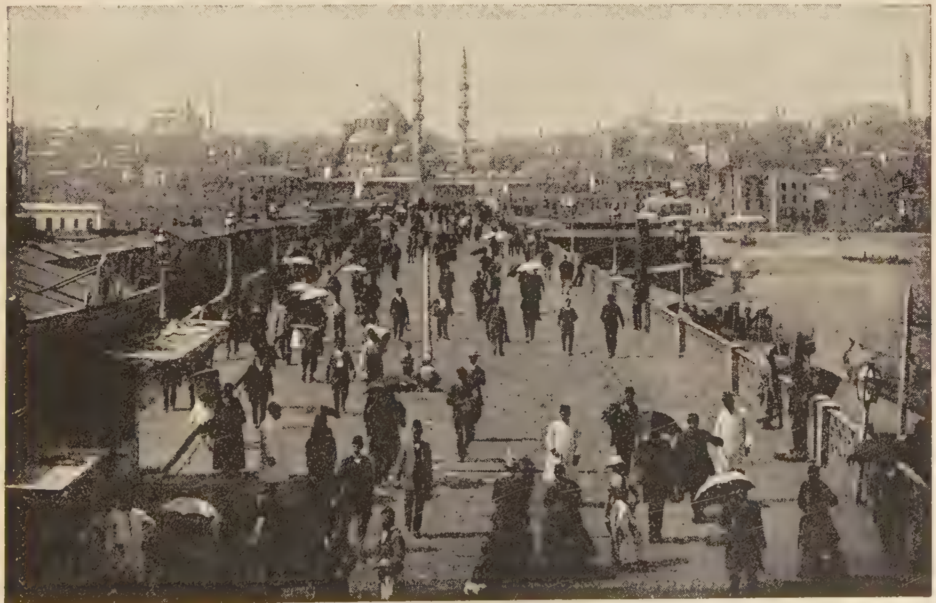
It is a flourishing country now. The Danube and other rivers make splendid waterways by which to convey the stores of golden grain from the fields, and the minerals, metals, oil, salt, and coal from the mountains. Railways are progressing, and Bucharest is a busy trade centre, as are also the ports on the Danube and the Black Sea.

Bulgaria lies south of the Danube. The ruins of the palaces of its old rulers show what was their magnificence a thousand years ago. Rulers they were who sat decked out with pearls and diamonds and gold chains, on an ivory throne ornamented with gold and blazing jewels, in a palace adorned with marble pillars and mosaics. After the Russians invaded Bulgaria in the twelfth

CONSTANTINOPLE, THE KEY OF THE EAST



Constantinople, built, like Rome, upon seven hills, is of such importance that all nations covet it. It is picturesque and dirty, but the old, insanitary, narrow streets are becoming fewer and fewer. This picture of the Turkish capital shows the varied character of its architecture. Buildings of European appearance are everywhere mixed up with mosques that have their roofs covered with rows of little domes looking for all the world like mud pies.



The Golden Horn, an arm of the Bosphorus, divides Constantinople into two parts. On one side is Stamboul, the old city where the Turks live, and on the other side Galata and Pera, inhabited mostly by Christians and Jews. Two bridges of boats join the old and the new cities, and one of these, the Galata bridge, is shown in this picture. We are looking from the Galata side of the city, across the Golden Horn, at Stamboul.

The photographs of Athens and Cettinje on page 3218 are by the Photochrome Ltd.

century, the races mixed very much, and ever since, during the 500 years in which Bulgaria suffered so greatly under Turkish rule, Russia has shown much sympathy in helping it to freedom.

Things came to a terrible pass about forty years ago, when the Turks massacred men, women, and children after every rising against Turkish cruelties. Mr. Gladstone, in England, roused public opinion; and finally Russia went to war with Turkey in defence of the people who were of the same religion and largely the same race as herself.

THE BATTLES IN THE BALKANS THAT SET BULGARIA FREE

Heroic campaigns were fought in the passes of the Balkans in 1877 and 1878; and, finally, by a treaty signed at Berlin by Russia, Turkey, Austria, and England, it was agreed that Bulgaria should be a principality still under the Sultan, but with a Christian government and a prince to be elected by the people. The province the other side of the Balkans—Eastern Rumelia—was to remain under the direct authority of the Sultan; but this arrangement was overthrown by a revolution a few years later, and Rumelia united with Bulgaria.

A great deal of corn is grown in the wide fields, and many cattle and sheep are reared on the slopes of the wooded Balkans; agriculture is improving, as in Greece, and small estates are the rule, worked by their peasant owners. There is plenty of convenient water power, and coal and ores in the mountains, all capable of development. Bulgaria is famous for embroideries and for the scent known as attar of roses. The decisive battle of Shipka, in 1877, was fought in the midst of the rose-gardens, of which there are some thousands of acres on the sunny slopes of the valley of the Maritza River.

THE LIBERATOR OF BULGARIA AND THE PRINCE WHO MADE HER A KINGDOM

Alexander II. of Russia is often called the Liberator of Bulgaria, and in the capital—Sofia—we find a monument to him, and a street named after Gladstone.

A bright, cheerful scene it is in Sofia, with the gay uniforms of the soldiers and the picturesque dresses of the peasants. These are best seen at the early morning market, when they bring their fresh produce in for sale. Fruit is very plentiful, and wine is made from the produce of the vineyards. Varna, on the Black Sea, is Bulgaria's chief port. Prince Ferdinand declared himself tsar, at the end of 1908, without the consent of Turkey or the other Powers who signed the Treaty of Berlin.

Servia is Bulgaria's neighbour on the west. It was once a much larger country than it is now, in the basin of the Morava River. At the beginning of the nineteenth century the country had a good Turkish Governor, but the fierce Janissaries put him to death, saying he was no friend of the Sultan's, and they then proceeeded to murder all the Servians who could be looked upon as leaders. Amongst the few who escaped was the leader called Black George, son of a peasant, and to him the country owes the independence which came to it by degrees. He organised a constitution and schools. He is deservedly looked upon as a national hero.

Belgrade, the capital, is situated where the Save and Danube meet, and has all through history been hotly fought for over and over again as one of the most important "gates" of central Europe. It is interesting to see the Hungarians who come across the Save to the market in Belgrade in their national costumes; their butter, cheese, and vegetables are of the best. At the Servian end of the market are splendid grapes and plums.

SERVIA, THE LAND OF LITTLE FARMS WHERE THERE ARE NO WORKHOUSES

Agriculture is prospering, and a good deal of wheat being grown. There are no large estates in Servia, but every peasant cultivates his own land, and there is no need for workhouses. There are beautiful highlands in Servia, and in the Morava Valley are fine forests of oak and beech, in which great numbers of pigs feed. A great deal of Servia's trade is with Austria-Hungary, by way of the Danube and its tributaries. Servia much desires certain lands and ports for its development, which Austria is unwilling to grant, and great forbearance is needed to soothe ruffled feelings and keep the countries of the storm-centre of Europe at peace.

Bosnia and Herzegovina are two small provinces to the west of Servia, with the Save on the north and the Dinaric Alps separating them from the beautiful coast of the Adriatic on the east. For 400 years they were part of the Turkish Empire, during which

OLD MOSQUES & NEW AT CONSTANTINOPLE

Constantinople is the great city of mosques. Altogether there are more than 500 of these temples of Moslem worship, and many of them are magnificent buildings. Twenty of the mosques date back to the days of the Byzantine Empire, and were originally Christian churches. In the two pictures on this page we have the old and the new types of mosque. Above is the great mosque built by the Sultan Bayazid at the beginning of the 16th century, and below we see the beautiful Hamidieh mosque built by the present Sultan in 1886. It is opposite his palace, and the picture shows how the troops guard the mosque when the Sultan goes to prayer.

time they seem almost to have disappeared from civilisation. At last the exasperated people rose against their oppressors in 1875; and at the Treaty of Berlin, after the Russo-Turkish war, they were handed over to Austro-Hungary to be managed by her for Turkey. The people were promised equal rights before the law, and protection in life, property, and worship.

THE BEAUTIFUL LANDS OF CORN AND FRUIT THAT AUSTRIA SEIZED

An immense change for the better is to be seen in this beautiful mountainous country of high peaks and deep glens. On the hills are a series of terraces sloping down to the lovely Adriatic coast of bays and islands, on which grow fruits of various kinds, and rich crops are raised in the valleys. Caravans of carts go along the improved roads full of produce for the railways, which have been built at immense expense in the wild country. As travellers pass through the tunnels, over the gorges, by the sides of steep precipices, they are reminded of the passage of the Rockies in North America.

Austria had promised not to do anything to alter the footing on which Bosnia and Herzegovina were governed, but Europe was surprised in October, 1908, by Austria suddenly adding the provinces to her own dominions without asking permission of the Turks.

Montenegro, about half the size of Wales, is a little, mountainous country, with many dark pine-woods on the slopes. Its inhabitants, like other mountaineers, the Swiss, the Scots, the Welsh, have always been famed for their bold spirit and energy and for the amount of freedom they have managed to retain.

THE BRAVE PEOPLE OF A LITTLE COUNTRY WITH A LITTLE CAPITAL

Tilling the fields in the valleys and tending flocks on the mountain sides are the chief occupations of these brave, handsome, kindly people. Here is no noise and bustle as in most countries. There is but one short railway at present, leading from the port of Antivari on the Adriatic to the Lake Scutari. There is a wonderful zigzag carriage road from the roomy and beautiful harbour of Cattaro—which belongs to Austria—to the tiny capital, Cettinje, where King Nicholas holds his court.

In 1912 only the four old provinces, Albania, Kossovo, Macedonia and Thrace, were left of the great Turkish Empire in Europe. Then the discontent which had been smouldering so long broke out into flame. Montenegro, Greece, Bulgaria and Servia all declared war, and if the great nations of Europe had not interfered, the Turk might have been driven from Europe. In a series of bloody battles the Turkish armies were defeated. More and more territory was overrun, until only a narrow strip was left under Turkish rule.

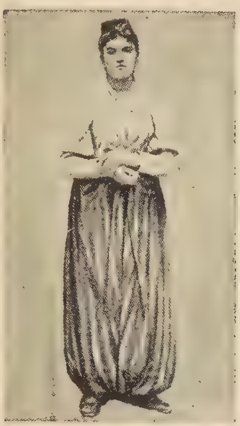
The Albanians declared that they must have independence, not only of Turkey but of the other states, and this was finally agreed to, but the division of the other conquered territory among the four allied states was not so easy, and in fact Servia and Bulgaria began to fight each other. Each country wishes more than the others are willing to allow, and the end is not yet. Peace and quiet in the Balkans seem far away.

CONSTANTINOPLE, THE WONDERFUL CITY OF MOSQUES AND MINARETS

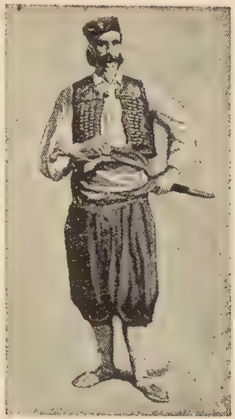
It is only of late years that railways have been made joining Turkey with the rest of Europe, with some branch lines to important ports on the Black Sea and the Sea of Many Islands. We can now reach Constantinople by the Orient Express in about seventy-two hours from London, passing cities whose names we so often meet with. Vienna, Buda-Pesth, Belgrade, are all on the main line to Constantinople.

But the more beautiful way to approach this wonderful city is by sea. Steamers from all parts come to the port of Greece, to the islands, to Constantinople, and the Black Sea beyond; ferry steamers ply across the Bosphorus as they do over the Hudson, between New York and Jersey City. Buildings of all kinds lie on the rising slopes, fine houses and palaces shaded with trees are everywhere, even down to the water's edge; and beyond them are the countless domes and minarets, or spires, of mosques. The ruins of the grand walls running from the Golden Horn to the Sea of Marmora, remind us of the old sieges and attacks through the centuries. Let us stand on

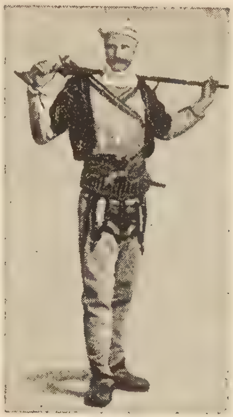
MEN & WOMEN OF THE BALKAN COUNTRIES



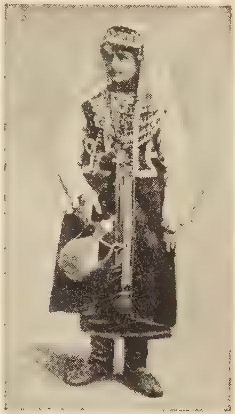
This is a young Servian woman of the Greek Orthodox Church, the religion that most Servians profess.



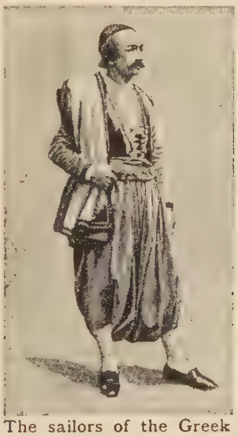
The picturesque national costume of Montenegro is shown in this picture of one of the prince's bodyguard.



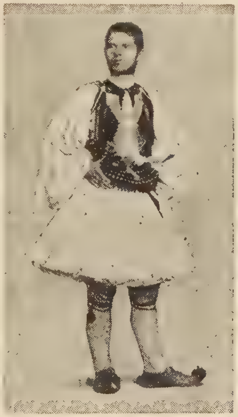
The people of Albania were formerly all Christians, but many of them, like this man, are now Mohammedans.



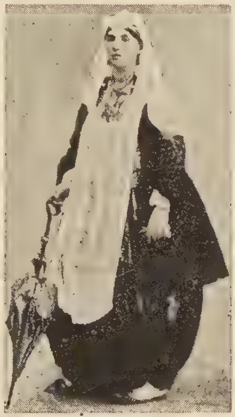
This is a Servian woman belonging to the Roman Catholic Church, as indicated by the way she dresses.



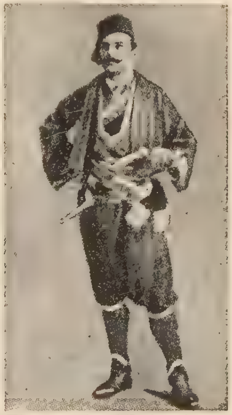
The sailors of the Greek seas are very unlike our ideas of what a sailor should be. This is a mariner of Cos.



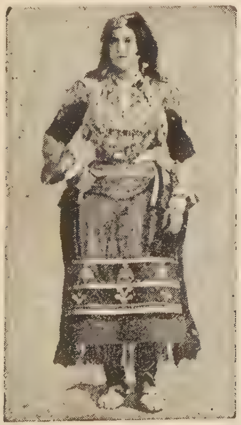
This is another type of Albanian warrior, and shows the curious kilted costume worn in the south.



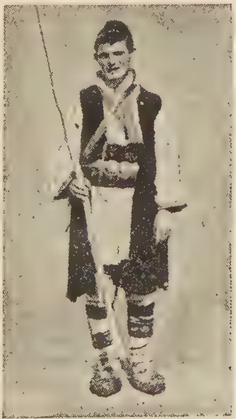
There are many Albanians who still remain Christians, and here we see a Roman Catholic lady of Albania.



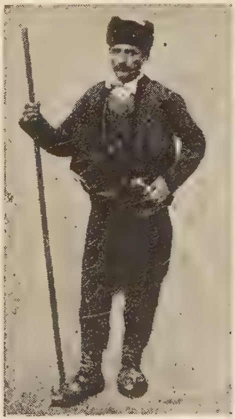
The people of Bulgaria, as shown in this picture, are a fine type. Elementary education is compulsory.



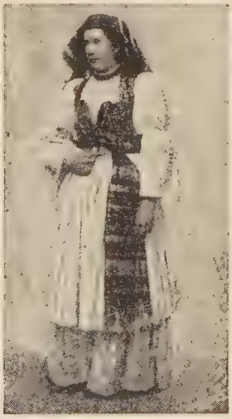
This is a typical peasant woman of European Turkey in the quaint costume she wears on gala occasions.



The Macedonians have often revolted against their Turkish rulers. Here we see a Macedonian shepherd.



The Bosnians, of whom this is a type, have much in common with Servia, but they are now Austrian subjects.



The Bosnian women wear a picturesque costume, an important part of which is the many-coloured sash.

the bridge over the harbour of the Golden Horn, which connects the old city of Constantine with the suburbs where Europeans chiefly stay. At Hamburg and Marseilles we have watched crowds of sailors of different nationalities; but here on the quays we are quite bewildered by the numbers of races, and costumes, and languages, for the city is still the centre of a very large trade.

Looking towards Asia, we see another suburb, Scutari, where there is an English cemetery; and in the straits are ships of every description, sailing under the flags of every nation in the world.

THE SULTAN WHO SHUT HIMSELF IN HIS PALACE AND MISGOVERNED HIS EMPIRE

The Sultan Abdul Hamid II. lived in a palace, like a town for size, beyond the European quarter of Pera. For years he was guarded and lived apart from his subjects, only coming into the city on rare occasions, and going to a mosque close to his palace every Friday to pray. It is difficult to realise how much power could be centred in the grasp of one man. It included absolute power of life and death over all subjects, absolute control of the finances of the country, and absolute tyranny in preventing freedom of the Press or of speech. A whole army of spies were kept busy reporting to the shut-up ruler what was going on in the different parts of his kingdom.

But in spite of the spies, and their lies and their cleverness, a great movement was going on quietly in Turkey for some years, before they knew much about it. Many of the best Turks were ashamed of the state of things in their country, and formed themselves into a society to try to devise a plan to better them. Some had to go to Paris for safety, some lost their lives on suspicion of holding liberal and new views. But their numbers grew, and no one betrayed the secrets they had sworn to keep.

THE REVOLUTION THAT CAME IN A NIGHT AND TRANSFORMED TURKEY

Much devoted work was needed to organise the society when its numbers rose to thousands, and to convey the necessary knowledge to suitable people and to make definite plans for action when the right time came for a revolution. What they wanted to do was to take all the power out of the hands of one man, who had so long paralysed the country and had brought it to disgrace before the countries of Europe, and to gain a constitution—one that would last; for some years before one had been granted and soon withdrawn. They wanted, too, that there should be a fair system of electing members to a Parliament that should settle the affairs of the country. It is easy to see that it was most important that the Young Turks, as the reformers were called, should have the army with them; so most cautiously and carefully, sometimes disguised as pedlers and barbers, the agents went about gaining the soldiers, and slowly things were ripening.

At last, in the month of July, 1908, in fear that the country would be humiliated by European reform, secrecy was laid aside, and the long-prepared blows were struck. Enver Bey, the head of the movement in Salonika, rushed through the villages preaching the revolution. Niazi Bey raised the standard in the interior, and the Macedonian Army Corps having been gained as well as the battalions from Asia, the Committee of the Young Turks felt strong enough to demand from the Sultan the acceptance of the constitution within twenty-four hours.

HOW THE OLDEST PARLIAMENT SENT CONGRATULATIONS TO THE YOUNGEST

The Sultan gave way. A constitution was granted, a proclamation made, a Parliament was ordered to be summoned, and so the revolution, one of the most amazing in history, that transformed the whole character of the government of an empire, and changed the traditions of centuries, was effected without bloodshed.

It was a wonderful sight when the Sultan went through Constantinople to open the new Parliament. But it was found that a constitution did not make everybody rich and happy, and friends of the Sultan stirred up discontent. In April, 1909, the soldiers in Constantinople who preferred the old ways rose and drove out the Parliament. The Young Turks were not discouraged, but at once marched to the city. Within a week order was restored. Parliament declared that Abdul Hamid was no longer the Sultan and raised his brother to the throne as Mohammed V.

The next story of Countries is on 3351.

THE CRUST OF A FIERY FURNACE

MOUNTAINS, GLACIERS, EARTHQUAKES, & VOLCANOES

CONTINUED FROM 3077

We read of the contrasts between deserts and forests on page 3071. Anyone making his first acquaintance with the face of the earth might think other things more striking than even deserts or forests, but we have learnt to think of the earth as owing all its meaning and value to life, and we have learnt that, from this point of view, the contrast between deserts and forests is the most important that the earth can show.

Perhaps the mountains are the objects that would most strike an observer, apart from the question of life—mountains and valleys and inland cliffs and what are called canyons. Cliffs on the seashore we already understand, we can watch the sea doing its work upon them almost any day; but we know that there are cliffs far from the sea, and mighty valleys which look as if they had been suddenly scooped out by some tremendous deluge of water. So first let us study these great ups and downs on the dry land.

Probably we are only just beginning to get a real understanding of the making of mountains. At any rate, we may be sure that the process was a gradual one. We may also be sure that the cooling and shrinking of the interior of the earth is one of the great underlying causes in the making of mountains. The view which is generally held—though we are beginning to suspect that it is probably not the whole truth—is that mountain ranges are formed by the crumpling of the earth's crust as it tries to fit itself to the shrinking interior. We see on page 407 a picture which very beautifully suggests how the crust may be supposed to have crumpled in three great lines running from north to south, those lines being represented by the three great mountain chains of the world.

Then, we are now beginning to believe that the marvellous element, radium, which is found everywhere, may possibly, by the power which it produces from inside itself, have had a share in the building of the mountains. But it is impossible to say more about that yet. Let us turn to the places where the dry land, instead of being piled up, is scooped out. Until the first half of the nineteenth century, men always supposed that valleys had been made suddenly by some mighty disturbance, like a great deluge. When we do not see the slow steps of a movement, and when they act for such long ages that the mind cannot appreciate the length of them, we fail to understand how great are the changes they can produce. When it was first taught that long lines of inland cliffs and mighty valleys had been formed, not suddenly, but by the slow working of agencies which are still at work, like wind and water, the students of the subject found it impossible that this could be, but now no one questions it. The discovery of the truth was the work of one of the greatest geologists, the Englishman, Sir Charles Lyell, who, like many other great men, was abused during his lifetime, but whom all students of the earth will always honour.

There was a time when a great part of the United States was under ice; indeed, that has been true throughout more than one past period of history. No one yet understands the real cause of the Ice Ages, and it will be best not to attempt to explain them. Probably, in a very few years, we shall learn how they came about. But, at any rate, we must know, when we study the mountains, that there were Ice Ages; and it is specially interesting to know that the Ice Ages were quite recent, as time goes in geology.

HOW MOUNTAINS AND BOULDERS TELL US OF THE STORY OF THE EARTH

Charles Darwin says: "The ruins of a house burnt by fire do not tell their tale more plainly than do the mountains of Scotland and Wales, with their scored flanks, polished surfaces, and perched boulders, of the icy streams with which their valleys were lately filled." In many parts of Europe we can study the action of ice upon the mountains even at this day. On page 409 we see a picture of a stream of ice flowing down a valley from an ice-covered mountain. These streams of ice are called glaciers. In very cold parts of the world we can find a glacier running right down to the level of the sea; but elsewhere, as, for instance, in Switzerland, of course we can only find the ice at a much higher level, say, four or five thousand feet above the level of the sea. In Greenland, for instance, as the ice of a glacier breaks at sea-level, it will form icebergs; in Switzerland, when the ice of a glacier breaks, it may tumble down the mountain, and form what is called an avalanche.

When we talk of a stream of ice, people may say: How can ice flow, and at what rate does it flow? Well, we may say that the rate of flow is a few feet each day, and the central part of the glacier moves more quickly than the sides because they are held back by the friction of the rocks between which it flows.

THE WONDERFUL REASON WHY A RIVER OF ICE FLOWS FOR EVER ONWARD

The same is true of any river, and we can also see exactly the same when we watch the blood flowing through a blood-vessel. The reason why the ice flows, as it does, is now understood. The weight of the ice makes it fall, and it is, of course, pressed upon by snow from above; but the glacier could not flow as it does were it not for the fact that when ice is pressed very hard it is melted, and then, when the pressure is removed, it freezes again.

So, as the glacier moves down, any obstruction in its way causes part of it to melt, and so flow over; and then, when the obstruction is passed, the ice freezes again. This curious property of ice can be shown with a block of ice and a piece of wire, which can be pulled right through the ice and yet leave a solid block behind. The pressure of the wire causes the ice to melt, and then, after the wire has passed, the ice freezes again. The ice that forms the glacier comes from the snow on the mountain heights. As this snow is squeezed and pressed, it turns into ice.

We need say no more about avalanches, except that they are not always made of ice. They may sometimes be made of snow, such avalanches being commoner in spring, while those of ice, which are broken off from glaciers, are commoner in summer. We are always to remember that icebergs are broken off from glaciers in parts of the world so cold that the glaciers can run right down into the sea. But when we see a picture of an iceberg, we should remember that only very little of it is visible.

THE HUGE MOUNTAINS OF ICE THAT FLOAT IN THE SEA

Only one-eighth or one-ninth part of an iceberg floats above the level of the water; all the rest is underneath it. So when sailors see, as they sometimes do, an iceberg which shows as much as 300 feet above the level of the water, we can get some faint idea of what a gigantic thing an iceberg may actually be.

Ocean currents may carry icebergs from the Arctic region far enough south to cross the routes of steamers, and occasionally Arctic animals have been seen carried south upon the iceberg in this fashion. If the warm water melts the buried part of the iceberg, it will capsize.

A WORLD THAT HAS HAD ITS MOUNTAINS RUBBED OFF

Glaciers and avalanches and rain, snow, frost, and air are always tending to rub away and smooth down the mountains. When we study the surface of a world which, in many respects, is very like our own, but is in a much later stage of its history, we can learn what happens to mountains. Our neighbour, Mars, has no mountains. We can be certain of this, since it can be proved that even very small mountains, if they were present, would be visible by modern telescopes. Night after night the astronomer may watch the edge of Mars, and never find a hint of a mountain. If there were anything as high as about 2,000 feet on Mars, it would be visible. Now, it may be that Mars never had mountains so large as the largest mountains on the earth, but the chief reason why Mars is now so smooth is probably that its mountains have become rubbed down and its surface smoothed out, as is probably happening now in the case of the earth.

Volcanoes are very special kinds of mountains, made in a special way. All volcanoes have the same shape, this being due to the fact that they have all been formed in the same way, by the gradual gathering of stuff which has been thrown out from the interior of the earth. Volcanoes are found in many parts of the world, some of them being still active, while others have never been known to throw up anything within man's memory. The hole in the centre of a volcano we call a crater.

THE HOLE IN THE EARTH THROUGH WHICH THE FIRE FROM THE FURNACE MAY COME

There are no large volcanoes on Mars; the moon is covered with objects which look like volcanoes, but some astronomers are now beginning to suggest that they are not really at all the same as the volcanoes of the earth, but were made by great meteors striking the moon. As the question is doubtful, we will say no more about it now. A volcano begins as a hole in the earth, more or less suddenly formed as the consequence of an earthquake. Recently a traveller had the good fortune to witness the actual birth of a volcano.

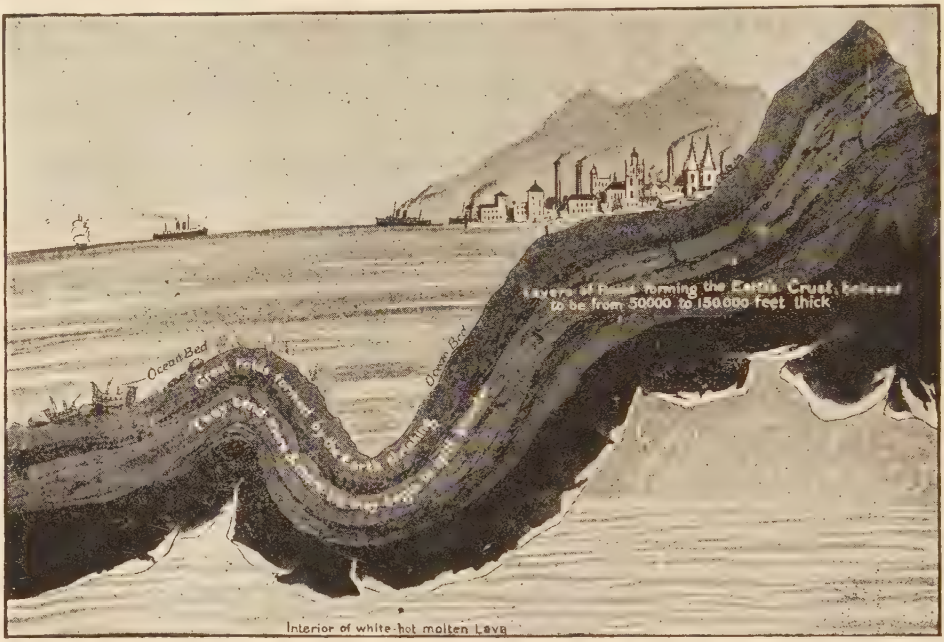
Through the hole or crack which is made in the earth there pour steam and a great many chemical substances, some of which strongly suggest that sea-water has been at work. Now, volcanoes commonly occur near the sea, and perhaps some earthquake under the sea admits sea-water to deeper levels, where it is turned into steam, and then perhaps forces its way out through the dry land, forming a volcano. We should also expect to find volcanoes in parts of the world that are liable to earthquakes, and, of course, we all know that Mount Etna, one of the most famous volcanoes in the world, is in Sicily, which is very liable to earthquakes, and has recently suffered from the most terrible earthquake of which we have record in history.

We do not yet know how and why a volcano should be quiet at one time and active at another, nor yet why volcanoes become extinct; but we do know that, owing to some cause or other, which probably really is the admission of water to the hot levels of the earth's crust, volcanoes pass into eruption, throwing out gases, liquids, and solid matter, all of which are intensely hot, and some of them actually burning.

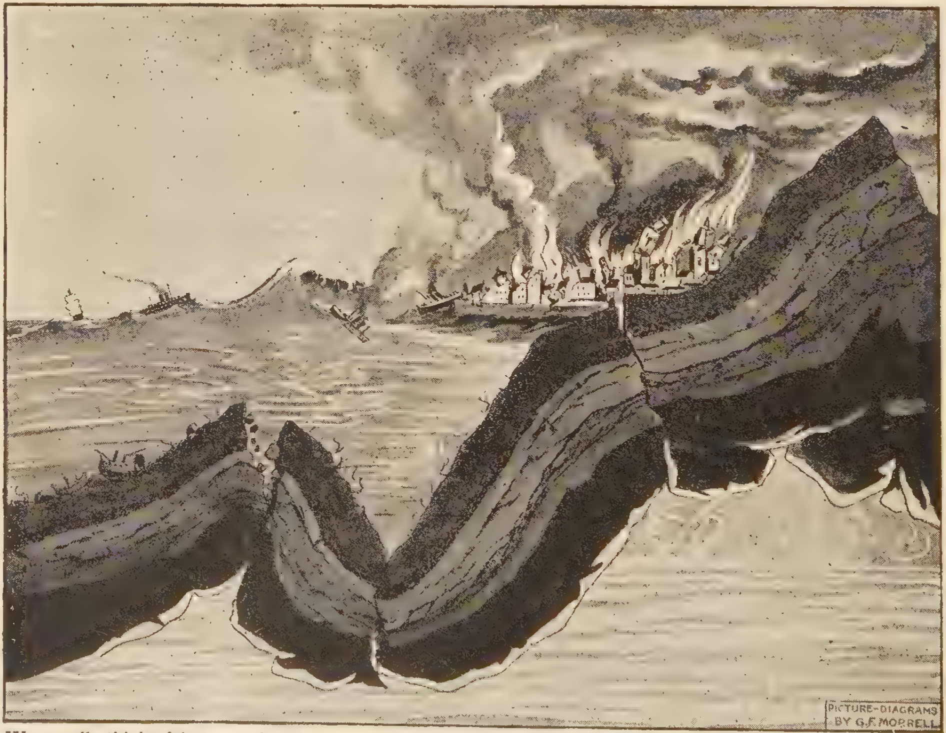
A GLOWING RIVER OF MELTED ROCK RUSHING DOWN A BURNING MOUNTAIN

After the first eruption, the stuff which is called lava begins to flow, often at several points, down the side of the volcano. Lava is simply a general name for melted rock running out of a volcano, and a very large number of different kinds of rock are found in lava. The melted rock is said to run somewhat as honey runs, and varies very much in its speed. A stream has been observed to travel at the rate of nearly a mile a minute, but that was very exceptional. When the melted rock first flows, it is white hot, then it becomes red hot, and finally black, not unlike cinders. Pumice-stone is really a kind of lava; it is the gas-filled froth of the lava stream. Another kind of lava is dark, and looks like glass, and has the special name of *obsidian*; this is quite a beautiful substance. It is extremely interesting to discover evidence of radium in the products of volcanoes. All this part of our

THE SPLITTING OF THE EARTH'S CRUST

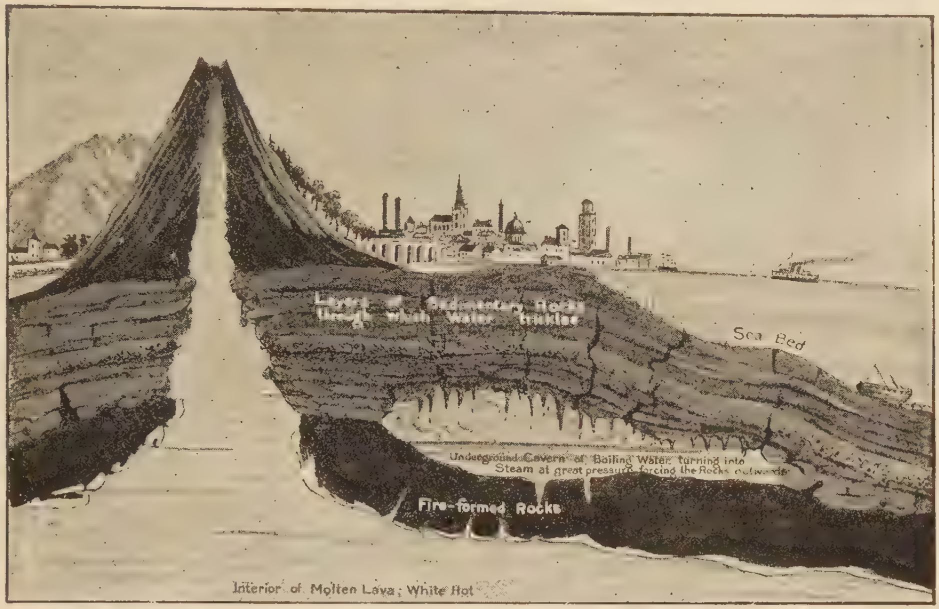

Ocean Bed
Ocean Bed
Layers of Rock forming the Earth's Crust, believed to be from 50000 to 150.000 feet thick
Interior of white-hot molten Lava

The interior of the earth is like a huge furnace, and we all live and walk upon the crust that is stretched over it. As the molten matter inside the earth gets cooler, the crust shrinks and crumples up, just as the peel of an orange shrivels when the orange gets dry. By this wrinkling the mountain ranges are formed, as shown here.

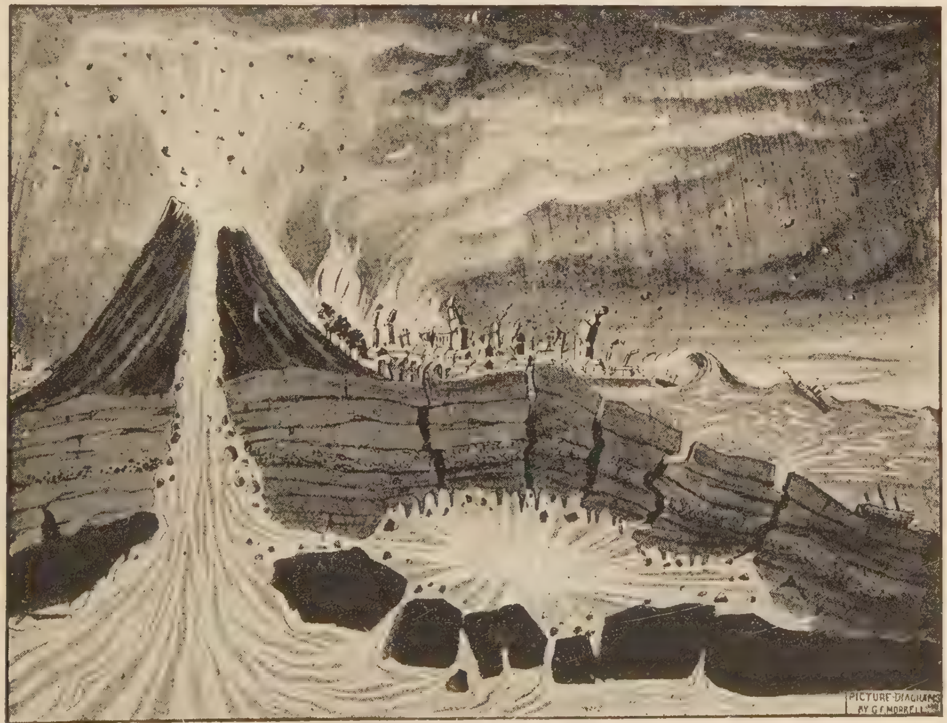


We usually think of the ground as being the one solid and firm thing that we know, until some terrible earthquake, like that at San Francisco or Messina, reminds us that even the ground is not stable. When the earth's crust at any point wrinkles so much that it is unable to bear the strain longer, the rocks split, as shown here, and the shock sends a shiver through the earth for hundreds of miles, causing buildings to shatter and fall.

HOW FIRE COMES OUT OF THE EARTH


Layers of Sedimentary Rocks through which Water trickles
Sea Bed
Underground Cavern of Boiling Water turning into Steam at great pressure forcing the Rocks outwards
Fire-formed Rocks
Interior of Molten Lava; White Hot

The pictures on this page show us at a glance one of the causes of volcanic eruptions and earthquakes. It is as though we were behind the scenes and could see the machinery by which Nature performs her most awful spectacle. This volcano is asleep, but processes are going on that will sooner or later cause a catastrophe.



Water is always trickling through the earth's crust from the sea, and the heat inside the earth turns it into steam. At last the steam pressure becomes so great that there is a mighty explosion. The rocks are rent asunder, and the molten lava from the interior of the earth, with boiling mud, is hurled forth in a fiery stream. The rending of the rocks, too, causes an earthquake. This is probably how the eruption of Mount Pelée was caused.

subject has been already greatly affected by the discovery of radium, and we do not yet know to what extent we shall have to change many old ideas.

WE LIVE AND WALK ON THE THIN CRUST OF A FIERY FURNACE

A geyser is in some ways like a volcano. The word really means a gusher, a hole in the ground which gushes forth a sort of fountain of steam and hot water. Geysers are best known in Iceland, New Zealand, and North America. Some of them throw up great fountains of water at regular intervals, and as the water contains a great many salts dissolved and melted in it, these salts are often left behind, and turn solid round the geyser. In this way something is formed which is really just the same as the crater of a volcano, though it is very much smaller. In both geysers and volcanoes we have to reckon with the great heat of the inside of the earth, and its effect upon any water that reaches it. We all live and walk upon a thin crust stretched over a tremendous furnace always on fire.

No wonder, then, that earthquakes are possible. But just because we know so little of the depths of the earth, it is very difficult for us to understand the causes of earthquakes. What we call the solid earth is always more or less in movement. The children playing on the hill near Greenwich Observatory are quite sufficient to shake the hill so that the astronomer's instruments are interfered with. But even the effects of the weight of heavy rain, or the influence of frost, will cause movements in the earth's crust; and delicate instruments easily detect these movements. Then, of course, a landslip down the side of a mountain, or the fall of an avalanche, will shake the earth to a great distance.

THE ENGLISHMAN WHO MADE MACHINES TO MEASURE EARTHQUAKES

All this means that the surface of the earth's crust is exposed to a great many kinds of disturbance acting on the *outside* of it. But true earthquakes, we know, are due to forces acting on the *inside* of the earth's crust, and it is these that may do tremendous damage. They are specially common in certain parts of the world. Though slight earthquakes occur in Europe, their case is very different from that of Japan, where earthquakes are exceedingly common, and where they have been specially studied. Indeed, it was not until an Englishman, Professor John Milne, began work in Japan in 1875 that we really learnt much about earthquakes. In that country, as he tells us, "at certain seasons of the year I might have them several times during the day, and not infrequently during the night." At that time there only existed instruments which showed that an earthquake had happened, but now Professor Milne and others have invented instruments which can measure the size of earthquakes.

This means that students of the subject are able to measure the forces which they have to reckon with in building houses or bridges. Having learnt the way in which the earth shakes during an earthquake, they made little models of different kinds of buildings, and shook these models in just the same way, in order to find out which kind of building stood best. It has been shown also that certain kinds of ground are more affected than others. It is better to build upon hard than soft ground, and to keep away from the edges of cuttings in the ground.

HOW EARTHQUAKES HELP MEN TO LEARN THE LAWS OF GOOD BUILDING

Professor Milne says: "After this, remember there are two types of structure you can put up. One may be compared with a steel box, and the other with a wicker basket. You can kick either of them about, and both will withstand the trials to which they are subjected. . . . It does not matter whether it is the steel box built for the rich, or the wicker basket built for the poor. If you have a good site, no earthquake which has occurred in historic times, unless the ground opens beneath your feet, can do more than disturb the ornaments on your shelves and the plaster on your walls."

At the Naval College, Osborne, in the Isle of Wight, there is a village built on these principles. We do not yet really understand earthquakes, but the study of the last thirty years has taught us what is in some ways more important; that is, how to protect ourselves from the damage to buildings and the terrible loss of life that earthquakes cause.

The next part of this is on page 3339.

CAN A SOUND BE FELT?

CONTINUED FROM 3096

When we come to think of it, we shall see that hearing is, after all, only a special kind of feeling, and so also are smell and taste and sight; but when we say, "Why cannot sound be felt?" we mean, "Why does it not affect our sense of touch?" The answer simply is that almost all sounds are too delicate a movement of the air for our sense of touch to feel. Otherwise, there is no reason, of course, why we should not feel them. In some people, whose brains are not quite well, any or all of the senses may become far more acute than they usually are, and such people can do things which it is very difficult for us to believe until we study the subject. Some of these people can apparently feel certain sounds with their skin; only, of course, they do not feel it as sound, but as a trembling movement in the air. The very lowest sounds can be felt as well as heard by ordinary people. The lowest pitched sound that we can hear is one made by about fourteen to-and-fro vibrations per second. It is possible to make a large, long, heavy tuning-fork which, when it is hit hard with a drumstick, will vibrate at this very slow speed. If a person's hearing is quite healthy, he can just hear this as a very faint and deep note; but it is quite easy also to feel the waves of air that it makes—that is, to feel them by the sense of touch just as they can be felt by the sense of hearing.

ARE THERE SUCH THINGS AS GHOSTS?

There are many things in the world which we do not know, and no one has the right to deny that there may be thinking and intelligent beings of whom we know nothing. But it is quite certain that there are no such things as ghosts.

In all ages a certain number of people have believed in ghosts, and this is not difficult to understand, since we know what tricks our brains may play us. In certain states the brain may quite easily make us think we see things that are not there, or hear voices which do not really exist. These mistakes have a long name which does not matter. I believe they are much commoner than we usually suppose, because most of the people whose brains make these mistakes say nothing about them. Also, if people believe in ghosts, it is very easy for them to think they see a ghost, when what they see is something else which they mistake for a ghost. This belongs to another class of brain mistake—in which there is really something there, but it is not what we think it is. In pictures or descriptions of ghosts, we find that they always wear some kind of clothes. That one thing is enough to show how absurd the belief is. In any case, our souls, or ourselves, are not material things having the same shape as our bodies, but even if they were, what could be more absurd than to believe that there are such things as the ghosts of clothes ?

SHOULD WE SEE THE WORLD GO ROUND IF WE STOOD STILL IN A BALLOON IN THE SKY?

Yes; and we should have a wonderful spectacle beneath us, for we should see the earth spinning under our eyes at a pace twenty times as quick as an express train. Also, if we went up in the daytime, the night would not come; and if we went up at night, the day would not come; for, whatever our position was in relation to the sun, there we should remain. But all this is quite impossible for a balloon which floats in the air, for the air is carried round with the earth, and the balloon must go round too.

It would be possible in an airship which could travel as fast through the air in the opposite direction as the air travels with the earth; as fast as the earth and the air spun one way, the ship would beat against them. So, of course, it could remain in really the same place, and the people in it could see the earth travel underneath them. But the earth is 25,000 miles round, and spins completely round in twenty-four hours, so the airship would have to be able to move at a tremendous pace, about ten times as fast as the fastest motor-car.

WOULD THERE BE ANY WEIGHT IN THINGS WITHOUT THE EARTH'S PULL?

The answer to this is practically no. What we call the weight of things is the earth's pull for them; and if the earth were to lose its power of gravitation, it would be just as easy to lift a house as to lift a little ball. The amount of matter in things would be just the same as it was before, only they would have lost their weight, or heaviness. So, when we mean to talk about the amount of matter in a thing, it is very much better to use the word "mass" than to use the word weight. The mass of a thing is wholly independent of gravitation, but the weight of a thing wholly depends on gravitation, and cannot exist without it. The mass of a thing is the same whether it be on the earth or the sun or the moon, but its weight would be vastly different in those three cases.

I said that the answer to the question was practically no, but it is not *quite* no, because there is another source of weight in things besides the earth's pull, and that is the sun's pull. Also, there is the moon's pull, and, indeed, the pull of all the other matter in the world everywhere. These other bodies are, however, comparatively so far away that though things would still have some weight owing to their pull, even if the earth's pull were abolished, yet we should scarcely be able to measure it, and certainly could not feel it with our hands. If all gravitation were abolished, nothing would have any weight.

HOW DOES SOAP MADE FROM FAT GET FAT OUT OF CLOTHES?

If soap were all fat, it certainly could not get fat out of clothes. Indeed, just in so far as there is any fat in soap, it is so much the less useful a cleanser. Therefore, there is never any fat in soap except in soaps which are specially made for use on people's faces. Soap is made from fat, but the fat is decomposed in making the soap. The fat is split up, and a certain part of the fat molecules is combined with the metals sodium and potassium, and that is soap.

Soap melted in water makes a mixture which, especially when it is warm, melts fat out of things and helps to carry it away; but the soaps which are the most effective cleansers contain a large quantity of potash or soda in them. This "free alkali," as it is called, makes the soap a very good cleanser, for it partly decomposes the oils and fats in things, and so helps to dispose of them. There is a great deal of free alkali in soft-soap. There are soaps of other kinds which are good for cleansing such things as metal surfaces, but have quite a different composition, and will not get fat out of clothes—"won't wash clothes."

DO PARROTS KNOW WHAT THEY ARE TALKING ABOUT?

I believe that no parrot knows in the least what it is talking about. The parrot has keen ears and a clever brain, so that it hears very distinctly words uttered in its presence, and so that it can reproduce with its throat and tongue and beak many of the sounds which it so cleverly hears. Of course, this is a very different thing from an echo, but so far as attaching any meaning to the sounds is concerned, parrot speech is only echo speech.

Small children reproduce words which they do not understand in just the same way, and I am afraid that grown-up people do so, too, sometimes. If we could believe that a parrot understood what it said, we should have to put the parrot on something like our own level in the scale of being. But we find that all words are just the same to a parrot, and it will repeat a word like algebra, shall we say, or hypnotism—if it hears it often enough—just as readily as it will repeat "pretty Polly." It is just a living echo, and no more, and the process that goes on in the parrot's brain is no more and no less than what goes on in our brain when we simply imitate or repeat the sounds of words spoken to us in some foreign language of which we know nothing.

IS IT CRUEL TO BURDEN HORSES?

This entirely depends on the amount of weight that we make the horse carry or draw. There are two ways in which we may be sure that it is not cruel to burden horses within proper limits. One is, that it is pleasant to every living thing to do what it is fitted for, so long as it keeps within the limits of its powers. If someone were to come from another planet, and were to see men playing football or running races, he might say that this must be very cruel, and ask who it was that compelled men to do these things; but the truth is that men enjoy using their muscles, just because they have muscles, and muscles are meant to be used.

People who drive horses know that the horse enjoys the drive as well as the driver, and that makes our second reason. No doubt, a horse would rather run without having to pull something behind it, but as long as it is well cared for and rested, I am sure that the horse is very happy and contented at its work. None of this means, however, that we are right to treat horses as we only too often do. I think that if we were not accustomed to it, and if we really thought about it, we should look upon the spectacle of horses drawing a heavy omnibus as not at all nice; and even that is not nearly so bad as many things which horses have to do. I also think that it is very bad for ourselves to use other living creatures for our purposes unless we are very careful how we do it. So I am glad that we use motor-cars nowadays, for with them we can be quite sure all the time that, however we treat them, we are not causing suffering to a creature that lives and can feel joy and pain.

DOES IRON INCREASE IN WEIGHT WHEN IT RUSTS?

We have to find out what happens when iron rusts, and then we shall have the answer to this question. What happens when iron rusts is, that the outside of it, which is exposed to the air, is burnt, or oxidised. A certain amount of the oxygen of the air is added to the iron, therefore. This oxygen, like everything else, has weight, and its weight must be added to the weight of the iron itself when the iron is rusty. Therefore, the answer to the question must be yes. The iron increases in weight by the weight of the oxygen which it has added to itself. But, as everyone knows, the rust, or *oxide of iron*, is friable, a Latin word which means crumble-able.

The rust will crumble away under the influence of water or wind or anything else rubbing against the iron, and so the iron thing will lose not only the oxygen that it has taken into itself, but also the part of the iron which has combined with the oxygen. So an iron thing, when it rusts, loses weight, and that is very serious, of course, for it means that the thing loses its strength. And if an iron or steel bridge were allowed to crumble away in this fashion, it would soon break. That is one reason why we must keep such a bridge painted to protect the iron from the air.

WHY DO THINGS FADE IF THE SUN SHINES ON THEM?

When such a thing as a curtain or a piece of cloth fades, it is because the chemical substances in it that give it its colour have been partly destroyed. Most of this colouring matter consists of substances which can be burnt, or oxidised, and if a thing is exposed to the air, of course there is plenty of oxygen round about it. The sun's rays destroy the colour, because they help on this chemical change that we call oxidation. Every photograph is taken because of the power of the sun's rays to produce chemical changes, and the fading of a piece of cloth exposed to the sun is really very much the same as what happens in a photographic plate. The part of the sun's rays which has this chemical power is the part which produces the colours of blue and violet when it strikes our eyes, and also two or three colour-notes, as we might call them, higher up than the violet, which our eyes cannot see, and which are called ultra-violet.

WHY DOES MY FACE TURN WHITE WHEN I AM FRIGHTENED?

Here is another question about the fading of colour, but it is very different from the last. The skin of our faces has a certain amount of colour of its own, but the main part of the colour of the face—at any rate, in this part of the world—is the colour of the blood shining through the skin. When I say shining, I do not mean that the blood gives out any light of its own, but that it throws back to our eyes the red part of the light that falls upon it through the skin. It is the heart that, as it beats, drives the blood through the skin of the face. When a person is frightened, the nerves running from his brain to his heart almost stop the heart from beating. So scarcely any blood whatever is sent through the skin of the face, and we see the pale colour of almost bloodless skin.

Anything that interferes with the heart's beating will have the same result as fright: bad air, for instance, causing anyone to faint. When a person's face becomes extremely pale, we should understand that there is a risk of his fainting, for if not enough blood is passing through his face, it is probable that not enough blood is passing through his brain. In some people, whose hearts are not well, it is difficult to supply the head with enough blood. These people are usually pale, and are liable to faint.

WHY DOES CHLOROFORM SEND US TO SLEEP?

All our consciousness depends upon work done by the brain. When we think, our brain is at work; or when we see, or when we feel pain. A person who has breathed a sufficient quantity of chloroform or ether, or who has had a large enough dose of opium or alcohol, cannot feel pain even when the skin is cut, because pain is really felt in the brain, and the brain of such a person is prevented from working.

The question, then, is: How do anæsthetics, as these things are called, stop the working of the brain? We do not know much about it yet, but we know that such an anæsthetic as chloroform is made up of certain chemical molecules; we can prove that when chloroform is breathed these molecules pass into the blood as it circulates through the lungs, and so are carried by it, in only a few seconds, to the brain. We know, too, that chloroform is a very volatile thing, and that it readily passes through the walls of the blood-vessels in the brain into the substance of the brain itself. There the chloroform molecules combine with the molecules of the brain, probably with the result that the brain can no longer use up the oxygen in the blood, and so has to stop working. But as soon as the person stops breathing chloroform, and the blood going to the brain becomes free of it, the chloroform passes back from his brain into the blood, is breathed away by the lungs, going back just by the way it came, and the person becomes conscious again.

WHY HAVE HORSES HAIR AND SHEEP WOOL, WHEN BOTH EAT GRASS?

It is one of the most wonderful facts about living creatures that they can turn into the substance of their own bodies almost any kind of food. As long as what they eat contains certain classes of chemical substances, they can use it as sources of the life of their bodies, and the life of their bodies produces the particular things that suit them.

Hair and wool are not really very different; wool is, indeed, only a kind of hair, and some races of men have quite woolly hair. But you might take certain kinds of food material, such as white of egg, and give it to any kind of animal, and it would be turned by each animal into a different thing—a bird would turn it into feathers, a sheep into wool, a fish into scales, a lobster into its shell, and a porcupine into quills. All this shows us how completely the life that is in every creature transforms its food, and can make, out of almost any food materials, the particular kind of thing that it is fitted to make. But no kind of food that you can choose or imagine will make the horse grow scales or the fish grow hair or the lobster grow feathers. The particular kind of life in each creature can do what it is suited to do, but can do nothing else.

WHY DOES THE ELECTRIC BELL RING WHEN WE PRESS THE KNOB?

We can almost answer this question for ourselves if we have in the house one of those electric bells that one rings by pressing the knob of a little round wooden box at the end of a wire. If we unscrew the top of this little box, we find little pieces of metal inside it, and we see that, when nothing is touching them, they do not touch each other; but if they are pressed upon they do touch each other, and then the bell rings. When we press the knob—though we see nothing—what we do is simply to press these two pieces of metal against each other, and as long as they touch each other the bell will ring. When we stop pressing the knob, the *contact*, as we say, between the two pieces of metal is broken, and the bell therefore stops ringing.

These pieces of metal are connected with wires that run from an electric battery. When they touch each other, the electricity from the battery can run round the wire. As we think of the electricity running round, we call this arrangement an electric circuit. In the course of this circuit, or circle, there is a bell, so arranged that whenever the electricity passes along it, the bell is disturbed and rings. When we press the knob we complete the circuit; when we let go we break the circuit, and then the electricity can no longer run round.

WHY CANNOT A BIRD FLY IF LET FALL FROM A BALLOON THREE MILES HIGH?

This is a very cruel experiment to make, and I do not see how anyone who had not a heart as hard as adamant could defend it; but the result of it is very interesting. As we go high in a balloon, the air becomes less and less dense, and breathing more and more difficult. The pressure of the air outside is not high enough to force enough air into our lungs, and so the balloonists suffer a great deal. If they take up a bird with them, it must suffer in just the same way. So, one reason why such a bird, when let drop, cannot fly would be that its brain was affected by lack of air in its blood; but even if this were not so, the bird could not fly, because the air at such a height is too thin, or *rare*, as we usually say, to support it.

A man's body is heavier than water, yet the difference is not so great but that by making certain movements he can prevent himself from sinking. If something could be done to the water so that it became thinner and lighter, the time would come when he would sink, whatever efforts he made. The ocean of air is so thin that no man is strong enough to swim in it. This is true even of the air near the ground. But some miles up, the ocean of air has become so thin that even a bird, with its tremendous strength in proportion to its weight, is not strong enough to support itself, and so it must drop.

IS THERE A FIRE IN THE MIDDLE OF THE MOON?

When we speak of the fire in the centre of the earth, we do not mean anything that is burning in the sense that a fire is burning, but something that is very hot, and so would glow if we could see it. In the case of the earth we live on, we can dig downwards and find how hot it gets as we go down, and we can study the hot things that come up from volcanoes. But it is very difficult to find out how hot even the surface of the moon is, and we cannot dig into it. We can only guess what the inside of the moon is like, then, and we can do this in various ways.

There is no doubt that the inside of the moon was once very hot, for the moon is scarred with tremendous volcanoes which prove it. These volcanoes now, however, do nothing. The inside of the moon, therefore, is certainly nothing like as hot as it once was. Further, the very size of these volcanoes teaches us that the process of losing its heat in the case of the moon has been a very rapid and violent one. Now, we know the size of the earth, and can learn something of the rate at which it loses its heat. Also, we know that this loss is very much retarded by the great blanket which we call the atmosphere. The moon must be made of very much the same materials as the earth, and when it was formed must have been as hot as the earth; but it has not an atmosphere to keep in its heat, and it is so very much smaller than the earth that it would be bound to cool very much more quickly, just as the earth, which is so much smaller than the sun, has cooled more quickly than the sun. Therefore, it is certain that the middle of the moon can be nothing like as hot as the middle of the earth, and probably it is not what we would call hot at all.

WHERE DOES OIL COME FROM?

If we look at the world around us today and observe where oil is being made, we find that it is made in the bodies of living things, and there only. The bodies of animals and human beings make it. You and I are, or ought to be, nicely clothed with a warm layer of fat, or oil, under our skins. The bodies of such animals as the fish make it, as in the case of cod-liver oil; the bodies of plants make it, as in the case of castor oil or olive or salad oil. Oils of these kinds, however, are scarcely at all used for burning; and the enormous quantities of oil that are every day burnt in the world are what is called mineral oil.

The word petroleum, for which petrol is short, means rock oil. Peter, as the Bible tells us, means rock. This mineral, or rock, oil is found in various parts of the world; and just in those same parts of the world there is found natural gas that can also be used for burning. It has quite lately been learnt that we are wrong in supposing *mineral* oil and gas to be the products of minerals and rocks. When we examine such a thing as petrol chemically, we find that it has the composition of a thing that has been made by a living creature. We now believe that all oil, even including petrol and such things, has been made by life.

Just as coal is the product of past vegetable life, so, also, all these oils which we now use for the same purposes as coal are the products of past vegetable life upon the earth, and they have been gradually formed from the bodies of these dead plants by the process called distillation, under the immense pressure of the earth lying above them.

WHY DOES A DIAMOND CUT GLASS?

When one thing cuts another, it is because the thing that cuts is harder than the thing that is cut. The steel of a knife is harder than paper, and so it will cut paper. Anything will scratch or mark anything else which is less hard.

So we can take a number of different things and can arrange them in order. A list of ten things has been made in this way; and so we can say that glass, for instance, has the hardness of six, which means that it will scratch anything that has a hardness of one, two, three, four, or five, but will be scratched by anything having a hardness of seven, eight, nine, or ten.

Most glass and a knife are much of the same hardness. Pure rock crystal or quartz will scratch a knife and will scratch ordinary glass. The precious stone called a sapphire is harder than any of these, and ranks nine on the scale of hardness. Emery paper is coated with an impure sort of sapphire substance. Number ten in the scale of hardness is the diamond, which will cut any other thing whatever, including glass or a knife or a sapphire. The Greek word adamant means unconquerable. When we want to say that a thing or a person is as hard as can be, we say "as hard as adamant."

WHY HAVE WE DIFFERENT TASTES IN EATING?

We know that no two people look quite the same. Everyone's face is differently made from every other face. We know that when we take prints of the markings on people's fingers they always differ from one another. We have never yet found two finger-prints in different people that were quite the same. And just as people differ in their faces and in their skins, so they differ in deeper things. No two brains are quite the same, and so no two people have quite the same tastes.

But there are other special reasons why people have different tastes in eating. Different people's bodies have different needs. One person's body may require a good deal of fat, and may be very capable of digesting fat, and so that person will like fat and oily things—which may be less good for another person, and which that other person likes less. Then, again, at different ages we have different food requirements. Children are very active, and since they are small, lose their heat quickly. They therefore require a large proportion of food to supply them with energy and heat. Perhaps the best of such foods is sugar, and that is the good reason why children and young people like sweets and sweet things more than most grown-up people do. This is not greed, but the demand of the body for what it specially needs. Thus tastes differ, too, in different parts of the world. Eskimos live in cold countries, and eat blubber and other forms of fat to keep them warm; but in hot countries people are much less fond of fatty foods.

WHY DO WE LEARN LATIN WHEN NO COUNTRY TALKS IT?

Not so many hundreds of years ago Latin was the universal language of all scholars. In those days, anyone who had a book to write wrote in Latin. So Newton in England, and Galileo in Italy, and Copernicus in Denmark, for instance, all wrote the same language. Anyone who meant to be a scholar, then, of course had to learn Latin. Things have utterly changed now, but children are still taught Latin, and the real reason is, that children used to be taught Latin, and therefore children are taught it to-day. The reason commonly given is that we must learn Latin in order to enjoy the great authors who wrote in Latin. If that were the real reason, then the teaching of Latin would be a terrible failure, as not one boy or girl in ten thousand ever gets to that point. Also, nowadays all the great writers of antiquity have been well translated into every modern language by great scholars who spent their whole lives in finding out the exact meaning of what those authors wrote.

Yet there is still a very good reason why everyone who has plenty of time for his education should learn a little Latin. This is that it helps us to understand and appreciate the value of English. For instance, take that last sentence. Everyone who has learnt Latin knows that appreciate means "put a price to," and that the word value comes from a Latin word meaning *to be strong*, as when we say a valiant man, or that a person or a thing is invalid—not strong. If a boy has learnt Latin for a few years at school, it thus helps him to use and enjoy his own language—which is half Latin.

WHY HAS OUR LANGUAGE SO MANY WORDS TAKEN FROM OTHER LANGUAGES?

Our language would be a very poor thing if it had not the advantage of helping itself to all the words it wants from other languages. Men had been reading and writing and thinking for many ages when our ancestors were savages. The various races who invaded Great Britain long ago brought with them their languages, and all the scholars who have read Greek and Latin have introduced words from those languages, such as the word "introduce," which means "lead within." English is the most mixed language in the world, and that is exactly the reason why it is the best, having more variety, more power of expression, more power of being turned equally well to purposes of beauty, to purposes of dignity, or to purposes of exactness, than any other language there is. Most of our commonest words are Anglo-Saxon in origin, a great many are Norman-French; a few are Keltic, many are German, and many more—the number of which is daily increasing—are Latin and Greek.

WHY HAVE WE DIFFERENT WORDS FOR THE SAME THING?

Language would be apt to be rather dull if we had only one word for everything. For instance, we should have to repeat it so often that it would become tiresome. Then, again, if we have different words for the same thing, we can use them, if we are clever, so as really to mean different varieties of the same thing. A poor language will have only one word where a very rich, full language, like our own, will have such words as joy, delight, pleasure, happiness, bliss, rapture, ecstasy—which all mean practically the same, and yet do not mean quite the same thing. We should use them to express different shades of meaning, and so we could say of somebody who became happier and happier that joy became bliss, and bliss became ecstasy.

Apart from this, there are many cases where we have two or more words for the same thing simply because they have come from different languages. For instance, commencement is sometimes used instead of beginning; the former comes from Latin, the latter is the good old Anglo-Saxon word, and we should always use it in preference to the other. Then, also, we have words which are really the same, only that one of them has come to us from Latin through the French; while the other is a word which came into English directly from the Latin at the time of the revival of learning. Such words are called doublets, like loyal and legal, royal and regal, sure and secure, and many more.

IS THE COLD OF WINTER DUE TO THE SUN'S GREATER DISTANCE FROM THE EARTH?

The earth is *not* farthest from the sun in winter; it is then nearest to the sun. But the distance of the earth from the sun has really nothing to do with the weather in any way, and we should get this clearly into our minds. The fact that the earth does not move in a circle round the sun, but in an ellipse, as we know, so that its distance from the sun varies, is enormously important, because the law of gravitation would not be true if the earth moved in a circle. Indeed, Newton measured and discovered gravitation partly by knowing how the earth moves round the sun. But the path of the earth, though not a circle, is very nearly a circle; and the difference in its distance from the sun at different times is far too small to affect the weather. It may be that, long ages ago, the earth's path was much more elliptical than it is now, and then the difference in its distance from the sun may have been very important for the weather—but not now.

WHY DOES IT RAIN MORE IN WINTER THAN IN SUMMER?

The last question was wrong in what it suggested about the earth's distance from the sun, but it pointed out a very interesting fact all the same. For the sun's heat is much less in winter than in summer, even though the earth is rather nearer to the sun; and the reason for this is, that owing to the slight tilting of the earth, the rays of the sun do not come straight in winter, but slant, and so lose more heat on the way. So the question now is why there should be more rain when there is less sun to make rain. But, if we consider, we shall see that this reduction of the sun's heat in winter "works both ways." If there is less sun to draw up the rain, there is less sun to hold the rain or moisture in the air. Thus it might be that during the summer the warm sun drew up much moisture into the air, and that during the winter, when the air is cooler and can hold much less moisture, the rain came back again. There is probably a good deal of truth in this, but it is far from being the whole truth. There are wet days in summer, and there are often beautifully clear and dry days in winter. These facts are sufficient to show that the heat of the sun in various parts of the year is *only one* of the factors of the weather, as we say; *factors* is Latin for *makers*. At bottom the problem of the weather is really one of the atmospheric electricity, and we cannot answer all these interesting and important questions about the weather fully until we learn very much more about that.

HOW IS IT THAT WE LOSE THE SENSE OF SMELL WHEN WE HAVE A COLD?

The sense of smell depends upon scented things coming in the air to the lining of our noses, especially certain small parts of the lining of the nose. When we have a cold, this lining, or mucous membrane, of the nose gets swollen, and produces a much greater amount of mucus than usual, as we all can tell by the number of handkerchiefs we have to use in a day. The chief reason why we cannot smell so well when we have a cold is, I think, that this mucus, constantly pouring out of the lining of the nose and running over it, prevents the scent of things getting to the sensitive part of the nose, and washes away any solid scented particles that there may be in the air. Also, it may very likely be that the poisons produced by the microbes that cause a cold, poison the living cells of the mucous membrane, and also poison the tiny ends of the nerves of smell that run to it, so that even if scented things do reach the sensitive part of the mucous membrane, they cannot be felt.

This applies alike to scents coming in from outside and also to the scents of food, which pass up at the back of the roof of the mouth into the nose, and which, when we have not a cold, help to give our food half its flavour.

IS EVERYTHING A PART OF NATURE?

Certainly everything is a part of Nature. All truly great men, ever since men began to think, have known this. An English poet has said that all things are

> Parts of one stupendous whole
> Whose body Nature is and God the soul.

That was said by Pope. A later poet, Wordsworth, has written these lines, amongst the greatest in all our great poetry. He says that he sees in Nature something

> Whose dwelling is the light of setting suns,
> And the round ocean, and the living air,
> And the blue sky, and in the mind of man:
> A motion and a spirit that impels
> All thinking things, all objects of all thought,
> And rolls through all things.

Thousands of years before even Pope or Wordsworth, the great Indian thinkers saw the same thing, and said, "the real is one." Man, therefore, as Wordsworth said, his body and his mind, are parts of Nature. The laws of Nature and the laws of life apply to him, and the more we learn the surer we are that we are right when we call the whole of Nature the universe—a thing that turns and moves as one because it is a whole of which everything that exists is a part.

WHY CANNOT TWO PEOPLE DECIDE WAR AND SO SAVE MANY LIVES?

It is only the bad passions of men which prevent this from being possible. If two good and honest men, or two good and honest countries, have a difference of opinion about something, they will meet and talk it over, and will try to find out which is the right thing to do. If they cannot agree they will appoint some other person or country that they both trust to decide what is the right thing, and they will undertake to stand by what he decides. The person who does this in a game of baseball is called the umpire. The Latin word for an umpire is *arbiter*. So, when nations, or single persons, or employers and workmen use this method of settling their differences, it is called *arbitration*. It is, of course, in every way the best plan for settling differences.

But all nations are not good and honest, and if a nation wants something which it has no right to have, and knows that no arbitrator would award that thing to it, then it invents some false excuse, usually about its honour, and proceeds to dishonour itself by making war. This injures not only the nation it makes war upon, but itself and all other civilised nations. Gradually, as people come to see this, they will make those who govern the nations undertake to refer most disputes to arbitration. This change from war to arbitration is slowly but steadily going on, and will certainly continue until wars become less frequent. That will happen directly the ordinary people of all countries have sense to understand what harm war may do to them.

WHY DOES YEAST MAKE BREAD RISE AND BUBBLE?

The bread, or, rather, the dough, contains a certain amount of sugar, which has been made in it from the starch made by the wheat plant. Yeast consists of an enormous number of tiny living plants, which produce inside their bodies a ferment—a chemical substance which we have just learned how to separate from the yeast cells themselves; and this ferment has the power of working on the sugar in the dough so that it is broken up and changed into other things. These things into which the sugar is changed are two, alcohol and carbonic acid gas. We lose all the alcohol thus made, for it passes away into the air. The total amount of alcohol we thus lose in a year is enormous, and this is a pity, since we might use it for many purposes, especially for burning in lamps and motor-cars, and so on.

The carbonic acid, as it is formed, makes little bubbles in the dough, and as these get bigger and more numerous, they raise the dough and turn it into bread. We can make bread in another way by forcing carbonic acid into the dough from outside. This is perhaps rather a good way, for it saves the sugar in the bread, and that is a food.

WHAT CAUSES THE SPOTS ON THE SUN?

Though men have been watching sun-spots steadily for 300 years, and though we know a great deal about them, this question is a most difficult one to answer. We are not really quite sure at what depth in the surface of the sun sun-spots lie. They are certainly not quite on the surface of the sun, and they are dark because, as we can prove, less light and less heat come out from a sun-spot than from other parts of the sun. If we think of the whole of the sun's surface as a gas—as a glowing atmosphere indeed—we shall expect to understand it better when we know more about what happens in our own atmosphere.

We know that all sorts of twisting, twirling movements go on in the air, some of them being very large and travelling across it as they twirl; and the new experience of the air which people are gaining by flying through it in flying machines has taught us that these kinds of movements are to be found everywhere. But the sun's atmosphere is part of a globe which entirely consists of gas, and is intensely hot. So we may expect to find far more movement in it than in our own, and sun-spots must be caused by things which are going on much deeper down in the surface of the sun; and so, as the sun spins, the sun-spots we see spin with it, as we can see if we look at the three pictures on page 2081.

IS THE WHITE OF AN EGG PART OF THE CHICKEN, OR WHAT THE CHICKEN FEEDS ON?

The white of the egg, and very nearly the whole of the yolk, too, are not part of the chicken, but what it feeds on. If we look at an egg that has just begun to develop, we can see just at one point on the surface of the yolk the little thing that will be the chicken; and a day or two later we can see tiny little blood-vessels spreading out from this point over the yolk, so as to help themselves to the food in the yolk. Afterwards the white of the egg is also eaten up by the chicken. The white of an egg consists of albumen and water. Albumen means the *white* thing.

This egg albumen is not the same as the albumen which is in our blood and on which our bodies feed, but it is really very similar. When it is eaten up by the developing chicken, or when we eat the egg, young chicken and all, this egg albumen is changed by digestion into the blood albumen of the chicken or of ourselves, as the case may be. As nearly all the egg is nourishment for the young creature that is to develop, different kinds of eggs vary very much in size quite apart from the size of the creature that is to develop from them. Some creatures are born from eggs which contain no nourishment, as the nourishment is supplied in other ways, and such eggs may be so small that they can only be seen through the microscope.

HOW IS IT THAT FISHES ARE NOT SALT WHEN CAUGHT?

The part of the fish that we judge by is its muscles, which form its flesh, and which we eat. Though the fish swallows salt water, it only takes into its blood what it requires for the purpose of its life. If we look at it in this way, we shall understand how it is that the saltness of a fish's muscles is not very different from that of a chicken's muscles. When we study the whole animal world, we find that the proportions of salt required in the water or in the blood that we find in the bodies of many different creatures are very much the same. The cells that make up muscles are very much the same in their way of living and their needs, whether we find them in a bird, a fish, an ox, or ourselves. Thus we should not expect to find the flesh of the fish salter than that of another creature nor to find that it makes any particular difference whether the fish is a salt-water fish or a fresh-water fish. We must remember that the fish, like ourselves, has the power of choosing from the things which it swallows just those things which it needs for its life, and of taking them, and them only, into its blood.

WHY HAVE FACTORIES TALL CHIMNEYS?

We know only too well that the business of the chimneys is to carry the smoke from the furnaces into the air. It may be that if the chimneys are tall, it makes a better draught for the furnaces, but that is not the important thing. The point is that, according to our present way of burning coal, a large amount of the coal is wasted, and simply blown up the chimney without being burnt in the form of smoke. In the air this injures everybody and everything—men, animals, plants, pictures, houses, and all. But the higher it is sent into the air, the better is its chance of being blown away and thinned out before it settles. Evidently it would not do to have a chimney discharging factory smoke at the level of somebody's bedroom window, for instance.

But I fear that tall chimneys will be wanted—ugly though they are—even when we burn all our fuel in factories in a proper way, and discharge into the air only the gaseous products of its complete burning. Even in the most perfect kind of burning there must always be carbonic acid gas produced, since the chief element in fuel is carbon, and since carbonic acid gas is completely burnt carbon. This gas, which we produce ourselves as we burn, is a poison to us if there is too much of it in the air, and so it must be sent into the air as far away from our mouths as possible.

The next Questions are on page 3377.